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IMPLEMENTATIONS OF CLASSES AND OBJECTS IN APPLICATIONS FOR ECONOMIC ORGANIZATIONS

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***Abstract:** The paper presents the implementations of classes and objects in applications for economic organizations build on Java technologies. The IT systems are informations system that allows the collection, transmission, storage, data processing and dissemination of information thus obtained by using the means of information technology and specialized personnel in the automatic processing of data. The computer system comprises all internal and external, formal or informal information used within the company as well as the data that were the basis of their obtaining, the software required to process data and disseminate information within the organization, the procedures and techniques for obtaining based on primary data and disseminating information, the hardware platform necessary for data processing and dissipation of information and personnel specialized in data collection, transmission, storage and processing. The computer system is structured to meet the needs of different user groups such as management factors at the level of strategic, tactical and operational management, the personnel involved in the process of data collection and processing and the personnel involved in the process of scientific research and the design of new products and manufacturing technologies. An economic application that uses implementations of classes and objects offers more flexibility and a good encapsulation of the main components that are specific to IT systems.*

Keywords: *Java objects, business classes, IT systems, programing logic, informational support, application components, business interactions*

JEL Classification: *C23, C26, C38, C55, C81, C87*

1. Introduction

A class designates a category of objects and acts as a blueprint for creating such objects. A class models an abstraction by defining the properties and behaviors for the objects that represent the abstraction. An object presents the properties and behaviors defined by its class. The properties of an object of a class are also called attributes and are defined by fields in Java. A field in a class definition is a variable that can store a value that represents a particular property. The behaviors of an object of a class are also known as operations and are defined using methods in Java. The domains and methods in a class definition are collectively named members. One of the fundamental ways of representing complexity is abstractization. An abstraction denotes the essential properties and behaviors of an object that differentiates it from other objects. The essence of OOP is the modeling of abstractions, using classes and objects. The difficult part in this approach is finding the correct abstractions (Prabhu, 2019; Umair, 2019).

Each object is a data structure, associated with a set of methods. From the point of view of traditional procedural programming, the methods are functions or procedures. The invocation (appeal) of a method of an object is considered in the POO as the transmission of a message to that object, indicating the operation to be performed and the parameters required for this purpose. Objects with the same data structure and methods are a class. The class is an extension of the data type concept. The characteristics of objects and classes are: identity, encapsulation, aggregation, classification, inheritance and polymorphism (Monus, 2019; Pankaj, 2019).

API is the interface through which an application program accesses the operating system of the computer and other services offered by the computer or the network. Because Java is a POO language, various services are viewed as objects belonging to classes. In this situation, each Java API contains the description of the classes in a certain category of services: for communication with the operator, for the incoming / outgoing operations, for network communication, etc. The description is made from the point of view of the application programmer, that is, for each class, only the purpose of the

respective class is presented, as well as the public data and methods of the class, without giving indications on how the class is implemented. Thus the principle of encapsulation is respected. The programmer can use the respective classes in the applications he develops, because he knows all the data and methods that are accessible to them, their significance and the way they are used.

2. The Java classes and objects for business components

According to the principles of Object Oriented Programming (OOP), each object is the instance of a class. However, there may be several instances of the same class. According to the principle of identity each object must have a unique reference, by which it is distinguished from the other objects. In Java, object references are values of special variables, called reference variables.

The declaration of the reference variables is made in the form:

```
<class><variablename>[=<initialization>][<variablename>[=<initialization>]] *;
```

where

<class> - the name of the class of objects referred to by the respective variables;

<variablename> - an identifier;

<initialization> - an expression that assigns to the variable a reference to an object in class <class>.

This can be:

- another variable, which already has as value a reference to an object of class <class> or of a descending class;

- a string literal, if <class> is String;

- an expression by which a new instance of the <class> class or of a descendant class is constructed and which has as value a reference to the newly constructed instance.

As an example for the first two ways of initializing some reference variables we can give the following statement:

```
String str1 = "an example of a string", str2 = str1, str3;
```

The String class, which we will study in detail later, is the string class. In the above statement it is stated that str1, str2 and str3 are variables referring to objects in the String class. The variable str1 receives as a starting value a

reference to the string “an example of a string”; str2 is initialized with the same reference as str1; Finally, the str3 variable is not initialized. The program from the InitSir.java file gives examples of initializations and assignments of references to objects in the String class by applying these procedures.

According to the OOP principles, the class incorporates a data structure and a set of methods. The data is placed in fields. Each field has a name and a value that belongs to a certain type of data. At the conceptual level, the fields can contain data of primitive types or objects. In the case of data of primitive types, the field even contains its value, while, in the case of objects, the field actually contains a reference to the respective object. However, in order not to complicate the exposition unnecessarily, we will consider that the name of the field is, at the same time, the name given to the primitive value or to the object that it contains. One can easily observe the similarity between the field concept and the variable one (Chhajer, 2019; Loganathan, 2019).

In Java, the concept of variable is used for data in methods, while for data contained in classes or objects the field name is used. This name is also used in other programming languages for data contained in structures. In a program you can use several objects in the same class. In principle, the values contained in the fields of these objects are different, so each object has its own state. Consequently, in the memory “Java virtual machine” there is a data area reserved for each object, which contains the data fields of that object. There is, however, a category of fields, called static fields, whose values are unique to all objects in that class. It is considered that these fields do not belong to the objects, but to the class itself. In memory there is, for each class, a single memory area that contains its static fields. Static fields are thus considered to be class variables, while ordinary (non-static) fields are considered instance variables (Prabhu, 2019; Pankaj, 2019).

Methods are functions or procedures. The function returns a value, while the procedure does not return a value, but is used only to obtain a side effect. But there are functions that have side effects. For this reason, in Java, the procedure is considered to be a function, which returns the void value. Each method has a form signature:

<type> <name> ([<formal parameter list>])

where:

<type> - the name of a primitive data type or class, representing the type of the returned value; if the method does not return a value, the type is void;

<name> - is the name of the method and is an identifier;

```
<formal_parameter_list> ::= <parameter_statement> [, <parameter_statement>] * <parameter_parameter> ::= <parameter_type> [  
<parameter_name>]
```

According to this specification, the list of formal parameters, if there are such parameters, contains one or more parameter statements, separated by commas. Each parameter declaration contains its type and, optionally, its name. The parameter type can be a primitive type or a class name. Formal parameters are those that appear in the specification of a method and in its signature, as opposed to the actual parameters, which appear when the respective method is used.

In the specifications of the Java API documentation, for each method, its signature is preceded by one or more modifiers, of the form:

```
<modifier> ::= <modifier_of_access> | static | end | abstract  
<modifier_of_access> ::= public | private | protected
```

If the access modifier is public, the respective method can be accessed from any other class or from any object. If the access is protected, the method can be used only in the descending classes from the one in which it was defined. The methods with private access can only be used in the class in which they were defined, being “visible” from other classes. For this reason, such methods are not given in the API, depending on the implementation of the respective class. Here are two examples of such specifications:

The static modifier has the meaning that the respective method belongs to the class and not the instance, so it is a static method. Such a method can only change the static fields of the respective class, not the fields of the instances (Monus, 2019; Umair, 2019).

The final modifier has the meaning that the respective method can no longer be redefined in the derived classes, so it is a final method. The abstract modifier indicates that this is an abstract method, for which it is specified, for the time being only the signature and the meaning, but which must be defined in the derived classes. Classes that contain abstract methods are called abstract classes. Examples:

```
public static double atan2(double a, double b)  
public boolean equals(Object obj)  
public final void wait(long timeout)
```

The first of these methods belongs to the Math class and calculates the tangent arc in the ratio a / b ; both the arguments and the returned value are of double type. The atan2 () method is static. The second method belongs to the Object class and compares between two objects, returning a Boolean value (true or false). Unlike the first two methods, which are functions themselves, the third is a procedure, because it returns the void value. The method is final, so it cannot be redefined in the derived classes. It also belongs to the Object class. The formal parameters of the methods in the examples above could be specified only by their types, as follows:

```
public static double atan2(double, double)
public boolean equals(Object)
public final void wait(long)
```

Specifying the names of the formal parameters can be useful only to make the description of their meaning clearer.

In order for a program to use the values contained in the fields of the classes or instances (objects) it is necessary to use references to them. The reference to a field of an object is made in the form

```
<refer_to_object>.<fieldname>
```

For example, if the variable *w* has the value of reference to an object and this object contains the alpha field, the reference to the alpha field is made in the form *w.alpha*. Consider now that the alpha field itself is an object, which contains a field called beta. The reference to this field will be made in the form *w.alpha.beta* so it is indicated the beta field, contained in the object in the alpha field, which - in turn - is contained in the object referred to by the variable *w*. Such names, preceded by a point and another name, are called qualified names in the Java language.

The reference to a static field (of a class) is made in the form:

```
<class_name>.<fieldname>
```

For example, the reference to the static field PI in the Math class is made in the form of the qualified name Math.PI.

The reference to a method of an object is made in the form:

```
<refer_to_object>.<invoke_method>
```

in which the reference to the object is made as in the case of using a field of the respective object, and the invocation (appeal) of the method is made in the form:

```
<method_name> (<list_of_effective_parameters>)
```

The actual parameters (also called current parameters) are those whose values are substituted for the formal parameters when invoking the respective method. Each effective parameter is an expression of the same type with the formal parameter that it substitutes. For example, if the variable *z* is a reference value to an object that contains the method

```
public int omega(String str, int b)
```

the invocation of this method can be done in form

```
z.omega("a string", 723)
```

Instead of the literal "a string" you could put any expression that has the value of an object of the String class, and instead of the literal 723 you could put any expression that has the value of a number of type int, or that can be converted into this type. .

The reference to a static method (of a class) is made in the form

```
<class_name>. <method_invocation>
```

in which the invocation of the method is done as in the case of an ordinary (non-static) method. For example, invoking the atan2 () method in the Math class can be done by the expression Math.atan2 (x + 3, 2 * y-1) in which *x* and *y* are numeric variables.

Both static fields and static methods, instead of the method name can be used in the reference expressions and the name of an instance of the respective class. For example, if *m1* is a reference to an object in the Math class, then the expressions in the examples above can be written in the form *m1.PI* and *m1.atan2 (x + 3, 2 * y-1)*.

3. Development of class conversions and objects in Java

When assigning values to reference variables and other operations, conversions from one class to another are sometimes required. In Java, a variable referring to objects in a class can be assigned as reference values to objects in that class or any of its descendant classes, without the need for explicit conversion.

Instead, in order to move from the superclass (or from an ascendancy) to the class, explicit cast conversion is required, as in the case of conversions for primitive data types. The cast operator is formed, in this case, from the bum of the class to which the conversion is made, between round brackets. Thus, since the Object class is a superclass of the String class, the instructions are valid:

```
Object ob;  
String str1="a string", str2, str3;  
str2=str1;  
ob=str1;  
str3=(String)ob;
```

The assignment of `str2 = str1` is possible, since it is made between variables of the same class. The assignment `ob = str1` does not require explicit conversion, since it is done from class to superclass. Instead, assigning `str3 = (String) ob` required explicit conversion by cast, because it is done from the superclass to the class. By this, the programmer has assumed the responsibility that the variable `ob` has as a value a reference to an object in the String class.

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superclass to the class. By this, the programmer „assumed responsibility” as the variable `ob` effectively has as value a reference to an object of the class `String`.

Each object class is provided with one or more special methods, called constructors, which have the role of building in the memory of the Java virtual machine a new instance of the respective class. These builders bear the name of the class to which they belong. In the documentation of the respective class, all the manufacturers are indicated, specifying the number of parameters, as well as the type and significance of each parameter. For example, in the case of the `String` class, several builders are specified in the documentation, of which we mention here the following two:

`String ()` - constructor without parameters, which constructs an empty string (which does not contain any characters);

`String (String str)` - which constructs a new object in the `String` class, but with a content string identical to the one contained in the object with the reference `str` received as a parameter.

In order to execute a certain constructor, the new operator must be applied, in the form of the expression

```
new <constructor>
```

which has as a side effect the construction in the memory of the Java virtual machine of a new object, resulting from the application of the invoked constructor, and as a value of the expression a reference to the respective object is obtained. For example, the expression

`new String („new string”)` it has the effect that in memory an object is constructed that contains the string „new string”, and as a value of the expression a reference to this object is obtained (Monus 2019; Loganathan 2019).

If, for some reason (for example, lack of memory space), the object could not be built, the new operator returns the null value, that is, a „to nothing” reference.

The reference returned by the new operator can be used to initialize a reference variable, or to assign a value to such a variable. Let, for example, be the instructions:

```
String a = "a string", b = new String (a), c, d, e;  
c = new String (b);  
d = b;  
e = c;
```

three variables are declared with reference to string a, b, which are given values as follows: a is initialized using directly the literal „a string”; b is initialized with the reference returned by the expression `new String (a)`, so with a reference to a new object in the String class, having the same content as that of reference a; Finally, the variable c is assigned the value returned by the expression `new String (c)`, that is, a reference to a newly constructed object, containing the same string as object b. According to the principle of identity, these objects will have different references, even if they have identical contents. Instead, by assigning instructions `d = b`; and `e = c` new objects are not constructed, but are assigned to variables d and e as reference values to already existing objects.

The variables a, b, c, d, e contain references to objects in the String class. The references are here conventionally represented by arrows. In fact, they are the addresses of the memory areas occupied by the respective objects. Although the three objects contained the same, they each have their own identity, so they occupy different areas of memory and have different references (addresses) (Chhajer 2019; Umair 2019).

Let's now look at what happens if the variable b is given as a reference value to another object in the String class, using for this purpose, for example, one of the instructions:

```
b = "high sir"; or  
b = new String ("alt sir");
```

The value of variable d remained the previous one (indicates the object to which it indicates above and b), instead variable b now contains a reference to the newly formed object, with the content of „another string”.

If an object is no longer needed, it can be destroyed, ie removed from memory. In Java virtual machine, there is a garbage collector that automatically frees up the memory space occupied by objects to which there is no reference. As a result, the programmer is no longer able to explicitly foresee the destruction of objects and, therefore, the classes no longer contain destructors, as in other POO languages.

Example of a situation in which some objects remain without references:

```
e = b;  
a = "Our Sir";  
c = new String (a);
```

The following transformations were made:

- the reference e has been assigned the same value as the reference b;
- an object with „New Sir” content was built. and the variable received as reference value to this object;
- an object with the same content as the indicated one was constructed, and the variable c now indicates this new object.

As a result, two of the „one string” objects originally built remained without reference. There is no way in the program to use these objects, so they must be eliminated. This role is fulfilled by the waste collector. However, the programmer does not have the opportunity to decide when the actual elimination of these objects will occur, the decision pertaining only to the waste collector.

4. Conclusions

In object-oriented programming, the close connection between data and the operations performed on them also extends to the data structures. Each objects is a data structure, associated with a collection of methods (functions or procedures) through which these data are manipulated. Each object is characterized by its state and behavior. The state of the object is characterized by the values that have, at a given moment, the data contained by it. If one or more such values are changed, the state of the object is changed. (Chhajer, 2019; Pankaj, 2019). From the point of view of procedural programming, the method can be a function or a procedure. The difference between them is that the function is invoked / called to obtain its value, also called inverted value, while the procedure does not return a value, but is executed to obtain a side effect, for example reading data from the keyboard, displaying some data on the screen, etc. Object-oriented programming supports the implementation of computer-oriented modeling techniques in the real world, which - in turn - are a component of object-oriented analysis (Prabhu, 2019; Loganathan, 2019). The objects and the implementations of those are the the best chice in developing enterprise economical applications. In this way the economical entitites are represented with their properties and their methods that define the economical actions and the business flows in which are involved.

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CURRENT SITUATION OF THE PROFESSIONAL TRAINING SYSTEM AT THE LEVEL OF ROMANIA

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Abstract: *Vocational education and training systems are in the midst of changes and transitions to the knowledge-based economy and society and therefore their continuous adaptation is required. The relevance of vocational education and training (VET) for the labor market remains a challenge, but the new initiatives aim to improve the situation. In Europe, the economic and social developments of the last decade have shown the increasing need for a European dimension of vocational education and training. Moreover, the transition to a knowledge-based economy, capable of sustainable economic growth, with more and better jobs, with a higher degree of social cohesion, creates new challenges in the field of human resources development.*

Keywords: *education, professional training, vocational education, labor market*

JEL Classification: *I21, I25, I28, I29*

1. Introduction

Over the years, cooperation at European level in the field of vocational education and training has played a decisive role in the creation of the future European society. The enlargement of the European Union adds a new dimension and new challenges, opportunities and demands of the activity in the field of vocational training.

In general, vocational education and training (VET) contributes to the development of human capital, increasing the knowledge, skills and competences of people, as well as social, cultural and identity capital and has positive effects on a personal level, on the level of pay, career development, improving employability, health and quality of life.

Studies in the literature related to VET indicate that the implications of the process are even broader the training process continues to generate benefits and rates of return similar to those of the initial education process (EU cooperation in education and training - ET 2020).

Numerous quantitative studies and research conducted in several states show that VET brings numerous economic and social benefits such as higher wages for workers, increased productivity for organizations and economic growth in general (European Commission, 2017-2019; European Commission, 2015b; Eurofound, 2015; European Commission, 2017a, 2018, 2016b). Also, the VET process is considered a tool for promoting inclusion and social equity, contributing to health and job satisfaction. Also, at the level of the economic entities the process of vocational training leads to the increase of the labor productivity, it encourages the cooperation between the workers, thus creating a positive working environment. The workers respond positively to the “effort” of the company to invest in the training of human resources.

At the national level, the recognized economic and social benefits of VET include increasing competitiveness and sustaining economic growth, facilitating the integration of disadvantaged youth and other groups into the labor market, and promoting social inclusion, in general, by improving employment and promotion prospects for individuals.

2. Vocational training in the context of the Europe 2020 strategy

European cooperation on vocational education and training was launched in Copenhagen in 2002 (The Copenhagen Declaration, 2002) and was subsequently strengthened by the Bruges Communiqué (EQAVET, 2010) in 2010 and the Riga Conclusions in 2015 (European Commission, 2015a).

The Copenhagen process was launched with the Copenhagen Declaration (2002), approved on November 30, 2002 by ministers with responsibilities in the field of vocational education and training in the Member States, the candidate countries for accession, the EFTA-EEA states, the European social partners and The European Commission. They agreed on priorities and strategies for promoting mutual trust, transparency and recognition of competences and

qualifications in order to increase mobility and facilitate access to lifelong learning. The declaration aimed at improving European cooperation in the field of VET. This highlights the contribution of education and training to the challenges identified in the Lisbon strategy:

- strengthening the European dimension of VET;
- improving the transparency of information and counseling systems;
- recognition of competences and qualifications - including non-formal and informal education;
- promoting cooperation in the field of quality assurance.

The next three ministerial meetings – Maastricht (European Commission, 2004), Helsinki (European Commission, 2006), Bordeaux (European Commission, 2008) – reiterated the priorities set in Copenhagen and, in addition, specified the priority areas for the next period. The progress evaluation meeting, organized in Bordeaux at the end of 2008, set the objectives and directions of action for the period 2009-2010, the most important being:

- implementation of tools and schemes to promote VET cooperation;
- increasing the quality and attractiveness of VET systems – by promoting the attractiveness of VET within all target groups and excellence and quality;
- improving relations between VET and the labor market – by ensuring the involvement of social partners; developing the validation and recognition of non-formal and informal learning outcomes; increasing mobility;
- strengthening the cooperation arrangements – by increasing the efficiency of mutual learning activities; strengthening the relations between VET, school education, higher education and adult vocational training.

Through these documents the European Union, the candidate countries, the countries of the European Economic Area, the social partners of the EU, the European Commission and the European providers of education and training have agreed on a set of objectives for the period 2015-2020 (European Commission, 2008):

a) “promoting learning in the workplace in all its forms, paying particular attention to the apprenticeship (by involving social partners, businesses, chambers and VET providers) and by stimulating innovation and entrepreneurship;

b) further development of quality assurance mechanisms in VET;

c) increasing access to VET and qualifications for all, through more flexible and permeable systems, and by facilitating the validation of non-formal and informal learning;

d) further strengthen key competences in VET programs and provide more effective opportunities to acquire or develop these skills through initial vocational education and training (VET-I) and continuing education and training (VET-C) .

e) introduction of systematic approaches and opportunities for the initial and continuous professional development of teachers, trainers and mentors of VET, both in the school environment and in the workplace ”.

These European Commission actions in the field of VET are supported by the European Center for the Development of Vocational Training (Cedefop) (which contributes to the development and implementation of European VET policies) and the European Training Foundation (ETF) (which contributes, in the context of EU policies). in the field of external relations, in the development of human capital).

The VET systems in the member countries are supported by the European Union either through various instruments, such as:

- through the European Credit System for Vocational Education and Training (SECEFP), the VET students are helped to obtain the validation and recognition of the competences and knowledge acquired in different systems and countries;
- member States are supported in promoting and monitoring the continuous improvement of VET systems (based on commonly agreed references) through the European Quality Assurance Reference Framework (EQAVET);
- the 14 criteria contained in the Council Recommendation on a European Framework for Quality and Effective Apprenticeship Programs (European Commission, 2017b) that EU countries and stakeholders should use to develop efficient and high quality apprenticeship programs;
- starting with 2016, every year, the European Week of professional competences is being carried out, with the aim of improving the attractiveness and image of VET;
- in 2013, the European Alliance for Apprentices was established, which effectively mobilized EU Member States, countries of the European Free Trade Association and EU candidate countries and over 230 stakeholders to take part in strengthening the offer of apprenticeship programs. and increasing their quality and image;
- the European network of apprentices, created in 2017 in order to support its members in adopting measures at VET and apprenticeship programs;

- in developing policies and practices for teachers and trainers to enhance their potential, as well as to improve apprenticeship programs and workplace learning, the decision-makers are supported by the ET2020 Working Group for VET;
- the interagency group on technical and vocational education and training (IAG-TVET), led by UNESCO, ensures the coordination of activities between the main international organizations, which are involved in the policies, programs and research activities regarding vocational and technical education and training;

or through financial instruments, of the type:

- ✓ the Erasmus + program, which has an indicative (initial) financial package totaling EUR 14.774 billion. For the period 2014-2020, almost 3 billion euros of this amount will be allocated to the VET and every year, about 130000 students and 20,000 VET staff benefit from the mobility opportunities offered by Erasmus +;
- ✓ the European Social Fund (ESF): between 2014 and 2020, around € 15 billion was allocated, among other things, to strengthening equal access to lifelong learning and promoting a flexible career path, as well as improving the relevance for the labor market of systems. of education and training.

As a key instrument for the modernization of vocational education and training, the Strategic Framework for European cooperation in the field of vocational education and training (EU cooperation in education and training - ET 2020) elaborated in 2012 by the European Council, can make a major contribution to achieving the objectives of the Europe 2020 strategy (European Commission, 2010). But for this, ET 2020 needs to be adjusted by updating its work priorities, tools and governance structure.

In this context, the long-term strategic objectives of EU vocational training policies are:

- i) to improve the quality and efficiency of vocational education and training;
- ii) to promote equity, social cohesion and active involvement of citizens;
- iii) to increase creativity and innovation, including entrepreneurship, at all levels of education and training.

But, in order for lifelong learning and mobility to become reality, there is a need for flexible access to new learning and qualifications, the development of a strategic approach regarding the internationalization of EFP-I and EFP-C, but also the promotion of international mobility.

To increase the chances of success in life, to support equitable, sustainable and inclusive growth and to guarantee social cohesion, it is necessary to increase the level of skills, promote cross-cutting skills and find ways to better anticipate future needs in the force market. for work.

In this context, in June 2016, the European Commission (2016a) adopted a comprehensive New Agenda for competences in Europe. Its purpose is to guarantee the assimilation of a wide range of skills from an early age and to maximize the human capital of Europe, which will ultimately lead to increased professional insertion and competitiveness, as well as stimulation. economic growth in Europe. Also, in 2017, EU leaders proclaimed the European Pillar of Social Rights, as a guide for increasing employment and social convergence and for promoting better opportunities especially for young people in Europe (European Commission, 2018).

2.1. Vocational training in Romania from the perspective of targets and indicators derived from the Europe 2020 Strategy

As a member state of the European Union, Romania is actively contributing to the strategic framework for European cooperation in the field of education and training - ET 2020. In this context, the objectives assumed by Romania in the field of education and lifelong learning, for 2020, are:

- reducing the early school leaving rate to a level below 11.3%, the EU target being 10.0%);
- reaching at least 26.7% of young people between the ages of 30-34 who have a tertiary or equivalent education level (EU target: 40%);
- promoting lifelong learning and increasing the participation rate of the population in vocational training continues up to 10% (EU target: 15%);
- increasing the impact of career counseling services offered to secondary school students, which would significantly contribute to informing and raising awareness of students' native abilities, both by themselves and their families and by teachers;
- reducing the level of functional illiteracy;
- increasing the employment rate of graduates between the ages of 20 and 34, at most 3 years after graduation. With an employment rate of 70.6% of graduates in 2017, on the whole of the ISCED education levels 3-8, Romania is below the European average of 76.2% and far from the target of 82%, proposed at European level for the year 2020;
- the participation rate of adults in lifelong learning programs was, in

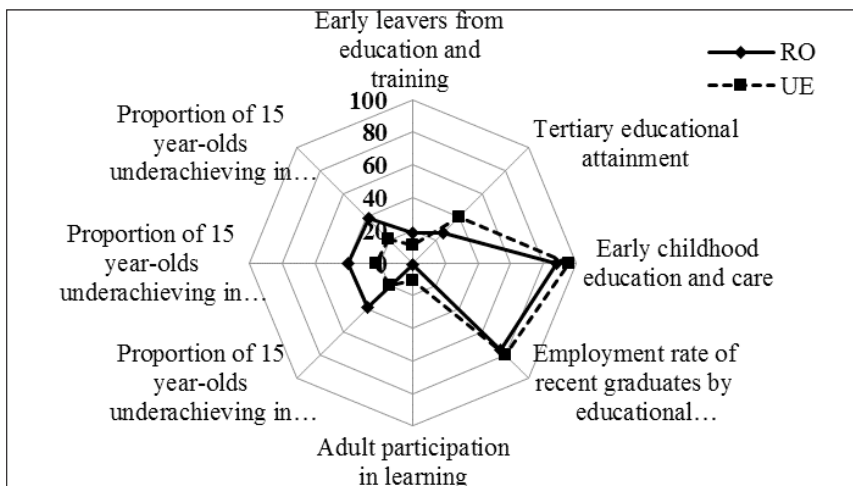
2017, 1.1%, well below the European value of 10.9% and far from the target of 12% proposed by Romania for 2020.

Therefore, the analysis of the indicators and benchmarks underlying the elaboration of policies in the field of vocational education and training in Romania indicates that the initiatives adopted in the last years have led to an improvement of the situation, but the differences with the EU average are still significant (Figure 1), (European Commission, 2017-2019). The relevance on the labor market of vocational education and training (VET) is, for Romania, still a challenge, but the new initiatives adopted in recent years are aimed at improving the situation.

Romania, as a Member State, elaborated, by an act of the Chamber of Deputies, the Decision no. 92 of 4 October 2016, opinions on the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A new agenda for competences in Europe (NACE) COM (2016). By this statement of principle of the Romanian legislative, the main axes of the European initiative are supported (European Commission, 2016b).

In the spirit of the recommendation, the Ministry of Labor and Social Justice has also assumed the role of coordinator of its implementation at national level and a series of recent changes to the Romanian legislation have taken into account the need for the training of persons with low qualifications, including of persons with level 1 qualification.

Figure 1. Indicators of vocational education and training in Romania in a European context



Data source: *Education and Training Monitor* (EU Commission, 2017-2019)

According to the data provided by the National Institute of Statistics (TEMPO-online database, 2017), in the last years there has been a tendency of decrease of the employed population that has primary studies or has no studies at all (from 3.54% in 2015 to 2.79% of the population occupied in 2017). Thus, approximately 5-6% of the unemployed are without education or only with primary education.

In this context, by GD no. 92/2018 (2018) for amending the Government Decision no. 1.352/2010 regarding the approval of the structure of the Classification of occupations in Romania, the Government established the renaming of Major Group 9 of the COR, so that it is no longer called “Unqualified Workers”, but “Elementary Occupations”. Through these changes, the need for training for persons with low qualification level was identified and the possibility of authorizing vocational training courses for level 1 qualification is ensured.

An important step in the Romanian legislation was the transposition of the European Qualifications Framework (CEC-EQF), revised in May 2017 (European Commission, 2017c), in the national regulations through the approval of Order no. 5039/2126 of September 05 (2018) regarding the approval of the correspondence between the levels of the National Qualifications Framework, the documents of studies/qualifications that are issued, the type of education and vocational training programs in Romania through which the qualification levels can be acquired, the reference levels of the Framework European qualifications, as well as the access conditions corresponding to each level of qualification.

The problem of the competitiveness of human resources has been put back on the decision agenda as a priority area of intervention in the short and medium term in the context of Romania’s efforts to counteract the effects of the global economic crisis. Also, the context of the training policies is marked, in the last years, by the elaboration of the Strategy of education and vocational training (VET) that promotes the smart growth, achievable through major investments in education, research and sustainable innovation, inclusive growth, with emphasis on the creation of places. employment and poverty reduction (Ministry of Education, 2016). This is complementary to the National Strategy for Lifelong Learning 2015-2020 (Ministry of Education, 2015a) and the Strategy for reducing early school leaving (Ministry of Education, 2015b) and together with them aims to achieve the common objectives at European level regarding the increased participation in the labor market. a highly skilled and adaptable workforce, improving the education system and increasing its adaptability to the demand of the labor market, promoting lifelong education,

increasing the adaptability of employees and businesses, ensuring the qualifications and knowledge necessary for integration and mobility in the labor market and facilitating development economic.

Regarding the initial vocational training, in Romania, the high share of young people enrolled in vocational and technical education in the total of the students enrolled in the upper secondary education demonstrates the importance of the initial vocational training for the Romanian labor market. In the 2017-2018 school year, the percentage of students who opted for the profiles in the vocational sector was 8.0% and 2.5% of the total school population were included in vocational education.

Continuous vocational training ensures the growth and diversification of professional skills, by initiating, qualifying, retraining, perfecting and specializing people in search of a job, in order to achieve their mobility and (re) integration into the labor market. The vocational training programs for people looking for a job, according to the law, are coordinated at national level by the National Agency for Employment, which also organizes vocational training programs for these categories of adults through their own centers, through private centers or through authorized training providers. Also, companies can develop programs for continuous training of employees.

Statistical data available for 2015 indicate that the provision of vocational training programs to the employees in order to correlate the level of education and qualification with the demands of the labor market was a priority objective for 13586 companies (representing 26.7% of the total enterprises from Romania). The continuous professional training offered by the Romanian companies focused more on the training of the employed personnel through other forms of CVT (other than the courses) of the type: guided training, training or practical experience in the workplace; rotating staff to different jobs, by exchanging experience, temporary posting for specialization; training at conferences, lectures, seminars, the main purpose of which is the professional training of the employees; participation in training / knowledge improvement circles, quality circles; self-instruction including by electronic means of learning.

In terms of investment in vocational training, this was more pronounced at the level of large companies (67.4%), the share of medium-sized enterprises that offered CVT to employees in 2015 was 38.0%, and of small ones of 21.7%.

By economic activities, 25.1% of the total number of companies that provided training to employees through courses (internal and / or external) belonged to the manufacturing industry, 23.0% to the commercial ones (23.0%) and 12.8% to the from construction.

By size classes, the share of small enterprises in the total of companies that offered CVT was 55.8%, while large enterprises represented only 11.0%.

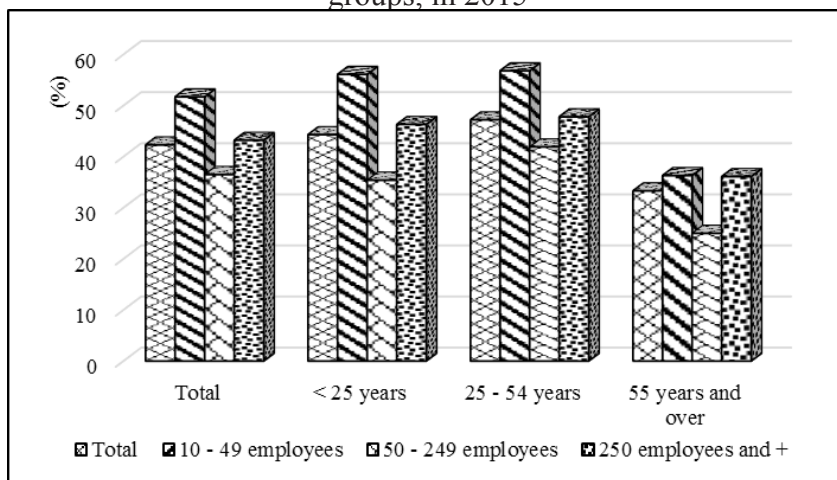
The overall participation rate for CVT courses in 2015 increased by 3.5 pp compared to 2010 and by 3.9 pp compared to 2005, thus reaching 21.3%. Regarding the overall participation rate of women in CVT courses, this was slightly higher compared to that of men (21.5% for women compared to 21.1% for men). By economic activities, the highest values of the overall participation rate were registered in financial and insurance intermediation (52.9%); production and supply of electricity and heat, gas, hot water and air conditioning (45.8%); the extractive industry (37.3%); respectively information and communications (32.2%). The lowest overall participation rates were found in other service activities (6.9%), respectively hotels and restaurants (8.7%).

And the rate of participation in CVT courses registered slightly higher values in 2015 than in 2010 (42.3% in 2015 compared to 41.2% in 2010) The participation rate of women in CVT courses was superior to that of men, both at the level of all enterprises, and by their size classes.

The highest level of participation in CVT courses (51.7%) was observed among small enterprises, with medium enterprises registering the lowest level of participation rate (36.5%).

The analysis of the evolution of the participation rate in CVT courses by age groups shows that within the 25-54 years age segment the highest value was recorded, regardless of the size of the enterprise (Figure 2), followed closely by that of young people under 25 years.

Figure 2. Participation rate for employees from companies that offered continuous vocational training courses, by size classes of companies and age groups, in 2015



Data source: TEMPO-online database (2017), National Institute of Statistics

The highest values of the participation rate were registered in the activities of financial and insurance intermediaries (67.0%); the production and supply of electricity and heat, gas, hot water and air conditioning (49.3%); information and communications (49.2%); trade (47.3%); respectively the extractive industry (46.5%). The lowest participation rates were found in constructions (27.4%), respectively other service activities (29.7%).

In 2015, only 4.0% of the companies offered initial vocational training courses (FP-I), by economic activities, their choice regarding the FP-I offer varied according to the specifics of each one, but also of the resources, financial and material available. Most of the companies that provided FP-I were those in the manufacturing and trading industries. The main reason for which the companies offered the FP-I was “the qualification of the potential employees according to the needs of the company”. Characteristic for the companies that carry out information and communications activities, namely the production and supply of electricity and heat, gas, hot water and air conditioning, is the fact that, usually, they employ 88.7 participants in the FP-I %, respectively 80.0%.

3. Conclusions

The role of vocational education and training in the labor market is still a challenge, both at European and national level. The new initiatives adopted aim to improve the situation. Implementation of EU recommendations regarding the education and training system, the measures adopted by the Member States regarding the professional development and updating of the qualifications and standards of vocational training aim at increasing the quality and efficiency of the workforce.

Statistical data shows that, in Romania, the share of investments made by enterprises for continuous training in total labor costs is very low.

Despite the urgent need to improve the qualification and retraining of the workforce at both national and regional levels, participation and access to learning among adults remain very low. Moreover, the participation in adult learning was 0.9% in Romania in 2018, well below the EU average of 11.1%. Also, although the digital skills of the population are improving, however, Romania continues to remain among the lowest in the European Union.

Regarding the continuous vocational training, 26.7% of the Romanian companies compared to 72.6% in the EU-28 offered vocational training courses to their employees in 2015, 42.3% of their employees participating in this activity. For the next period, with all the measures and policies adopted, there remain a

series of challenges, which can be mentioned: i) limited supply of non-formal education and training; ii) mobilization / reduction of the number of inactive adults; iii) insufficient coordination between stakeholders; iv) restrictive access to professional qualification programs for persons with reduced qualifications; v) monitoring, quality assurance and staff training; and so on.

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ACCOUNTING REPORTING COMPLEXITY MEASURED BEHAVIORALLY

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Abstract: *We propose a new measure of accounting reporting complexity (ARC) based on customized extensions XBRL elements in relation to the number of reporting tags (NRT), expressed as the relative Extension Rate (ER) as a behavioral economics solution to improve markets. Behavioral insights have recently gained attention in different scientific and applied fields. Thereby behavioral economists set out to improve market conditions to aid practitioners and consumers make wiser and more informed decisions that have a positive impact over time. XBRL extensions reduce comparability of financial disclosures and complicate financial analysis and investor decision making. We find that ER is negatively associated with market capitalization and profitability. ER is on average higher in industries perceived as complex. The preparation and disclosure of more accounting items deviating from the base taxonomy is more complex for consumers of financial and non-financial information. Increasing ER imply comparability among peers is less enabled. In comparison to commonly used measures of operating and linguistic complexity, the associations between ARC and these outcomes are more consistent, exhibit greater explanatory power, and have stronger economic significance. The*

ER resulting from IFRS-filers, i.e. companies which prepare their financial statements under International Financial Reporting Standard (IFRS) are on average significantly higher than US GAAP filers, i.e. companies which prepare their financial statements under United States General Accepted Accounting Principles (US GAAP). This article is based on the “transparency technology XBRL (eXtensible Business Reporting Language)” (Sunstein, 2013), which should make data more accessible as well as usable for private investors. Overall, the findings contribute to the emerging behavioral economics trend with a novel application in data science and accounting.

Keywords: *accounting reporting complexity, behavioral economics, behavioral insights, customized extensions elements, financial reporting quality and inductive method, IFRS taxonomy, nudging, relative extension rates, XBRL*

JEL Classification: *D03, F32, G15, G32, P34*

Introduction

Accounting complexity represents an important issue for academics as well as practitioners. Complexity has a long tradition to be discussed in behavioral economics – the interdisciplinary opening of neoclassical economics with an emphasis on addressing real-world relevant influences on decision making. An increase in complexity can have a negative impact and effect on the investor decision making as it influences the reporting quality. Assessing, mapping and analyzing accounting information is thereby deteriorated. Complexity is according to Iatridis (2011) regarded as directly related to the concept of accounting quality, as complexity increases when accounting quality decreases. While in the age of digitalization accounting also becomes digital, this paper will analyze accounting quality considering digital structured financial reporting. Ample evidence on the impact of complexity on decision making exists in behavioral economics (Bowles, 2004, Chapman & Elstein, 1995, Colinsky, 1996, Gentner, 2002, Giglio, Maggiori & Stroebel, 2014, Gintis, 2000, Green & Myerson, 2004, Kahneman, 2011, Ptaschunder & Schwarz, 2012); but what the implications are for digital economies remains unclear (Ptaschunder, 2019a, b, c, e).

Since the end of the 1970ies, Behavioral Economics revolutionized mainstream neo-classical economics and decision-making theory. Behavioral economists have recently started to nudge – and most recently wink – people into favorable decision outcomes, offering promising avenues to steer social responsibility in very many different domains, ranging from marketing,

corporate governance to public affairs and most recently financial leadership. A wide range of psychological, economic and sociological laboratory and field experiments proved human beings deviating from rational choices as standard neoclassical profit maximization axioms failed to explain how human actually behave. Human beings rather use heuristics in their day-to-day decision making (Puaschunder & Schwarz, 2012). These mental short cuts enable to cope with a complex world yet also often leave individuals biased and falling astray to decision making failures. What followed was the powerful extension of these behavioral insights in the domains of public administration and public policy making. Behavioral economists proposed to nudge and wink citizens to make better choices for them and the community. Many different applications of rational coordination followed ranging from improved organ donations, health, wealth and time management, to name a few. Behavioral Finance is one of the most novel developments in Behavioral Economics. In all this literature missing is clear information how to lead efficiently given mental shortcuts and behavioral biases in a complex world. Yet to this day, behavioral economics has not entered the emerging digital interactive research stream.

In the context of digital interactive reporting, the most recent academic literature assumes high volume and more unique company specific accounting information as to support the increase in complexity (Hoitash and Hoitash, 2017). However, measuring accounting complexity continues to be difficult as measures with high explanation power are not widely available. As a consequence, a large body of academic research substitutes accounting complexity with aggregate, indirect, and less exact measures of operating complexity.

Fueled by the widespread diffusion of the internet, the age of digitalization emerged in the last twenty years (Puaschunder, 2019a, b, d, e). The emerging autonomy of digitalization holds unique potentials alongside unprecedented economic superiority, data storage and computational advantages (Puaschunder, 2017a, b, c, d). With regard to Financial Reporting, this trend has led to the development of the Extensible Business Reporting Language (XBRL), which – according to the academic literature – is expected to revolutionize financial reporting (Matherne and Coffin, 2001). Financial reporting information can be automatically transferred to machines without the necessity to map, as financial reporting information is structured. XBRL is without cost available and has developed as the de-facto global language for exchanging business information electronically. XBRL taxonomy fixed by the regulator (e.g. Securities and Exchange Commission) provides an identifying tag for each individual item of data, whether numeric or textual. This tag is

computer readable and allows the information to be used interactively and more accurately as when provided in an unstructured format e.g. PDF format.

A main feature of XBRL is the optionality for the filers to create new tags (and a new custom taxonomy at the same time). This reflects the “X” which implies extensibility. These new tags are called customized extensions. Filers can create as many extensions as they want as long as local regulation allows. The background is that those customized extensions reflect voluntary new tags and are regarded as relevant to describe their specific situation. The aim of this paper is to investigate the determinants and value relevance of these extensions for market participants considering the new availability of interactive data from IFRS-filers. IFRS is a principles-based accounting regime and extensions rates are expected to be higher and more relevant based on early findings (Beerbaum, 2014). Those early findings can now – with the utilization of the new empirical data – become more substantiated and validated. Further analytical elaboration is now possible for the first time, given the larger data sets available and the novel computational power.

Studies on the advantages of XBRL for market participants are numerous but little is known about the mechanisms underlying the impact of taxonomy extensions and the practical nature of such extensions in the context of IFRS interactive filings. Similarly, our study is the first to focus on IFRS filers applying the IFRS Taxonomy, provide interactive filing and the first which is based on a large database of IFRS filers, as previous studies focused on US Taxonomy elements for each disclosure concept are not available, and thus the filer creates an extension element. Considering the US GAAP based literature GAAP (Chou and Chang, 2008, Debreceny et al., 2011, Hoitash and Hoitash, 2017, Li and Nwaeze, 2015), it is concluded that extensions without incorporating technical errors provide decision-useful information. However, if extensions are not correctly set-up – particularly when a semantically equivalent element already exists in the base taxonomy – extensions add no information content. Due to identified errors in interactive filings, critics express concerns that the reporting extensibility allowed under XBRL open taxonomy will reduce the possibility to compare companies to each other and financial disclosures increase their complexity and therefore complicates financial analysis. Proponents conclude that XBRL extensions will provide users with new and relevant information. Companies want to tell their specific story and reflect their competitive advantage and uniqueness. The results for later periods of XBRL adoption provide support for the SEC’s policy that

allows registrants to use XBRL extensions to increase users' understanding of the information in financial statements.

The focus of this study is on extensions and the analysis of correlations to other metrics. Prior research shows that the impact of XBRL adoption for market participants is important but the great majority of them considers XBRL implementation as a uniform process (i.e. adoption or not). However, this approach does not allow assessing how investors perceive information published by filers using XBRL's extensions. The results for later periods of XBRL adoption provide support for the SEC's policy that allows registrants to use XBRL extensions to increase users' understanding of the information in financial statements.

Since January 2009, when the Securities and Exchange Commission (SEC) issued rules on the submission of interactive filings applying the XBRL standard, a lot of articles have been prepared which describe the benefits of XBRL (Roohani et al., 2010). Those articles could only be based on interactive filings preparing financial statements under US GAAP. Since last year for the first time a larger number of companies' interactive filings became available, which also prepare their financial statement under International Financial Reporting Standards (IFRS).

Background of Accounting Quality and Accounting Complexity

Complexity is embedded into the concept of accounting quality (Iatridis, 2011). The term "accounting quality" needs, however, to be used carefully as it has different connotations and implications. The concept of accounting quality remains fuzzy. To this day it is unclear how an optimal output can be defined and what this optimal level for most of the accounting quality proxies is. Hence, it also remains unclear whether an increase (decrease) in the level of the accounting quality metric will necessarily lead to an increase (decrease) in what is supposed to be the (in fact unobservable) quality of accounting. To the knowledge of the authors, no theory clearly links the commonly used metrics to "true" accounting quality. A further problem is that several proxies for accounting quality exist and that it is yet not fully clear, which one is the most suitable. Further unclear questions are:

- (a) what is the connection or correlation between the different proxies,
- (b) whether and what kind of trade-offs between different proxies exist and
- (c) what conclusions about user's preferences can be drawn from earnings quality studies.

So far, there is almost no theoretical or model-based literature that would perform an assessment of earnings qualities with more granularity and of high practical relevance. Behavioral economics has offered ample evidence on the impact and relevance of complexity on the decision making quality (e.g., Ariely & Wertenbroch, 2002, Arrow, 1978, Ashraf, Karlan & Yin, 2006, Beshears, Choi, Laibson, Madrian & Sakong, 2011, Gaertner, 2009, Kaur, Kremer & Mullainathan, 2010, Ostrom, 1990, Sen, 1995, 1998, Thaler & Sunstein, 2008, Trope & Fishbach, 2000, 2004, Tversky & Shafir, 1992); but to this day no information is given for concrete implications of complexity in the digital accounting domain. The relationship between the different earnings quality measures is still rather unclear, implying that reliable estimates considering accounting quality might require controlling for other accounting qualities from an empirical point of view. This does, however, not imply accounting quality research, which would not have any impact on practice advice. A recent implementation is the SEC's attempt to automatically screen filings of all issuers and to calculate a risk score for potential fraudulent behavior based on accounting quality metrics. The Accounting Quality Model (AQM) – or “Robocop”, as the financial press tends to call it – automatically creates a risk score for all registrants within 24 hours after their electronic filings. A higher risk score makes the enforcement staff aware of the fact that a filer might be worth looking at in closer detail. Thereby, the system makes the SEC's inspections more efficient and effective.

Accounting quality can be addressed from an input and output perspective. Inputs relate to the quality of accounting standards and the quality of the reporting process. Outputs look at how useful the published reports are for economic decision making. According to IAS 1.9, the objective of financial statements is to provide information about the financial position, financial performance and cash flows of an entity that is useful to a wide range of users in making economic decisions. Financial statements shall present fairly the financial position, financial performance and cash flows of an entity. Fair presentation requires the faithful representation of the effects of transactions, other events and conditions in accordance with the definitions and recognition criteria for assets, liabilities, income and expenses set out in the Framework. IASB assumes that rigorous application of IFRS implies useful financial statements. IAS 1.17 consistently clarifies that in virtually all circumstances, an entity achieves a fair presentation by compliance with applicable IFRS.

IAS 8 sets out a hierarchy of authoritative guidance that management considers in the absence of an IFRS that specifically applies to an item. In

extremely rare circumstances it might happen that a firm concludes the application of IFRS would not result in a fair presentation. In such cases the entity shall depart from requirements that would violate a fair presentation if the relevant regulatory framework requires, or otherwise does not prohibit, such a departure. This overriding principle is set out in IAS 1.19, but is rarely used in practice.

There are two fundamental principles under which IFRS financial statements are prepared and both are relevant to accounting quality. Except cash flow statements, IFRS financial statements are prepared under accrual accounting (IAS 1.27).

Accrual accounting incorporates the effects of transactions and other events and circumstances on a reporting entity's economic resources and claims in the periods in which those effects occur, even if the resulting cash receipts and payments occur in a different period.

Going concern: Under this accounting concept the entity will continue to operate in the foreseeable future (i.e., at least within the next twelve months) and that there is no need to liquidate or curtail materially the scale of its operations (F.4.1).

The IASB Framework also sets out some qualitative characteristics of useful financial information. The two fundamental qualitative characteristics inherent to IFRS are "relevance" and "faithful representation" since the IASB assumes that useful information must be both relevant and faithfully represented (F.QC17).

Relevance: Relevant financial information enables of making a difference in the decisions made by investors (F.QC6).

Faithfulness: To be a perfectly faithful representation, a depiction would have three characteristics. It would be complete, neutral and not constitute any material errors (F.QC12).

Obviously, this constitutes a conflict considering relevance and faithful representation. However, it is the preparer's task to balance and find an optimal trade-off for this conflict with the aim to maximize decision usefulness. Besides objectives, with conflicting directions, there are also specific qualitative characteristics which restrict decision usefulness (F.QC19-34).

These include:

Comparability: Information is more useful if it can be compared with similar information about other entities and with similar information about the same entity for another period or another date.

Verifiability: Different knowledgeable and independent observers could reach consensus, although not necessarily complete agreement, that a particular depiction is a faithful representation.

Timeliness: Newer information might be more useful and should, thus, be reported in a timely fashion even when later disclosure could increase reliability.

Understandability: Information shall be presented in a way that users can access their content. The principle does, however, not suggest that complex information is allowed to remain unreported or would have to be reported in a way that users would not have to seek for advice if not competent to understand.

IAS 1 additionally contains a number of accounting principles which assure accounting quality from an input perspective is executed:

No offsetting allowed: An entity shall not offset assets and liabilities or income and expenses, unless required or permitted by a standard issued by the IASB. Prohibiting offsetting assures finer financial information because users can observe more than the net effect of certain transactions (IAS 1.32).

Focus on material aspects: An entity shall present separately items of a dissimilar nature or function unless they are immaterial (IAS 1.29). Information is material if omitting it or misstating it could influence decisions that users make on the basis of financial information about a specific reporting entity (F.QC11). Materiality is an ambivalent concept. On the one hand, it allows disregarding irrelevant information. On the other hand, it imposes the risk that information remains undisclosed due to the preparer's assumption of the information not being material.

Consistency across time: An entity shall retain and continue the presentation and classification of items in the financial statements regardless of any periods.

The three most used categories of complexity used in accounting research are operating, linguistic, and accounting-based complexity (Hoitash and Hoitash, 2017). Complex operations increase the difficulty to translate economic activities into accounting disclosures. Yet because detailed disclosures of firm operations are not widely available, researchers often select observable measures of operating complexity. The most common are the number of business and geographic segments and the existence of foreign operations. A higher number of business segments often suggests the presence of more complicated economic operations because segments typically have different products, services, processes, and/or customers and each segment often earns revenues and incurs expenses. In addition, because segments often transcend

industries, knowledge of accounting standards across industries is needed to disclose segment information. Similarly, companies with foreign operations or international segments are required to report and reconcile their overseas operations, further complicating the preparation of the financial reports. While these measures capture aspects of operating complexity that are likely linked to accounting complexity, they do not experience significant across- and within-firm variation and are not directly based on accounting disclosures.

ARC subsumes a portion of complexity that is captured by common operating complexity measures. Reportable segments data are captured by XBRL tags. Unlike a measure of the number of reported segments, ARC experiences greater variation as it fluctuates with the amount of disclosed segment information and not only with the number of segments disclosed. Similarly, accounting information that pertains to foreign operations is captured in greater detail by ARC. In addition, ARC also captures the disclosure of other accounting information (e.g., lease, derivative, inventory, and tax accounting) that is not captured by operating complexity measures.

Discussion

Globalization led to an intricate set of interactive relationships between individuals, organizations and states and to an unprecedented correlation of massive global systems causing systemic risk to increase exponential. Unprecedented global interaction possibilities have made communication more complex than ever before in history as the whole has different properties than the sum of its increasing diversified parts (Centeno et al., 2013). Acknowledging that Behavioral Economics revolutionized mainstream neoclassical economics, behavioral economics insights should further be used to analyze the digital economy in order to find strategies to improve human decision making in a complex economy world.

Future research may empirically try to consolidate how behavioral economics can improve markets. Stakeholder specific facets of behavioral sciences and the different scientific disciplines' approach towards digitalized economics could be outlined in the search for governance recommendations to regulate markets efficiently. Delineating the potential of behavioral economics to guide on the introduction of digitalization into our contemporary society portrays economics as a real-world relevant means to minimize societal downfalls and imbue ethics in the digitalized world economy (Puaschunder, 2018, 2019f).

Research extensions could address the evaluation of nudging and its influence on the stability of economic markets and digitalized systems. Depicting nudging during this unprecedented time of economic change and regulatory reform holds invaluable historic opportunities for leaders on how to strengthen society by nudges but also overcome unknown emergent risks within globalized markets. In its entirety, this paper serves as very first preliminary step targeted at bestowing market actors with key qualifications to lead and to follow regulatory guidelines and accounting standards strategically in a complex digitalizing world.

In these future research endeavors, scientists and practitioners are advised to also take a critical approach to the economic analysis of the corporation. By drawing from the historical foundations of political economy, a critical stance on behavioral sciences' use for guiding on corporate concerns could also be adopted as a heterodox spin. Behavioral Economics insights should be used for improving economic analyses to foster the accuracy and efficiency of corporate sustainability reporting. The analysis could thereby also take a heterodox economics stance in order to search for interdisciplinary improvement recommendations of the use of economics for the corporate world. Investigations should feature a broad variety of research methods and tools to conduct independent projects in a truly multi-methodological approach. Overall, all these endeavors will help gain invaluable information about the interaction of economic markets with the real-world economy with direct implications for corporate decision makers, governance experts and financial practitioners.

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DEPLOYMENT EFFECTS OF THE SOLVENCY II PRUDENTIAL INDICATORS ON ROMANIAN INSURANCE COMPANIES

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Abstract: *This paper shows the extreme way in which three Romanian insurance companies went through important economic-financial moments between 2004-2016 (Romania's accession to the EU starting January 1, 2007; the economic-financial crisis of 2008- 2010; introduction and application of the new system of macro prudential supervision Solvency II from January 1, 2016). The evolution of these companies is studied based on the main financial indicators in the Annual Financial Reports of each company. The three companies chosen are: ABC Asigurări which has the lowest market share, Asito Kapital which has undergone changes in the total structure of the shareholding and Carpatica - a company declared insolvent, in bankruptcy procedure, concluding with the withdrawal of the company's operating license as of 27.07.2018.*

Keywords: *SOLVENCY II, financial insurance evolution, Romanian insurance companies*

JEL Classification: *G19, G20, G22, G28*

1. Introduction

The challenges of the insurance companies determined by the global economic and financial crisis of 2008 have brought to the fore the necessity to deepen the existing studies (Order no. 3105/2005. 12; European Commission, 2002; Jakubík and Těplý, 2008; Sandström, 2005) on the risks to which they are subjected, and their more rigorous and detailed classification by taking into

account their complexity and diversity in a integrative approach (Eling and Schmeiser, 2010; Kočović, 2009; Larosière Report, 2009; Ryan et al., 2001; Schich, 2009; The Financial Supervisory Authority, 2019) to enable systemic risk prevention. Insurance companies, by managing the risks of economic activities, are part in the continuous economic processes in industry and agriculture, and in the stimulation of international trade and cooperation. Also, through investments on the capital market, they contribute to the development of the credit and the financing of some economic projects. In addition, insurance companies are financing actions to prevent and combat damage-generating events, thus contributing to maintaining the integrity of the property, stimulating domestic and international tourism through its forms of civil liability and personal insurance.

Solvency II (New Macro prudential Supervision Requirements), the new European Union regulations, have been developed with the purpose of harmonizing the methodologies of the member countries, increasing the degree of protection of the beneficiaries and the financial stability by introducing an efficient risk management. These regulations are included and implemented from January 1, 2016 also in Romania (Müller Report, 1997) regarding the authorization and supervision of the insurance and reinsurance activity (Solvency II supervision regime). According to Solvency II, it was necessary to increase the requirements for setting up the technical reserves and those regarding the capital requirement, taking into account the risks assumed by the insurance companies from both the investment perspective and the subscriptions. At the same time, some changes were made regarding the solvency requirements and the method of verifying the “total balance” for the measurement of risks was introduced.

In this solvency regime II, the size of the capital is not the only way to mitigate the failures. Compared to the previous EU solvency requirements, which focused mainly on the liabilities side (insurance risks), Solvency II takes into account the risks related to the assets, meaning all their risks and their interactions. In this respect, insurers are required to hold capital against market risk (regarding lowering the value of insurers’ investments), credit risk (for example when third parties cannot repay their debts) and operational risk (for example the risk of systems breakdown or malpraxis). Until 2016, those risks were not covered by the EU prudential regime. For the first time, insurers are required to focus specifically and devote significant resources to identify, measure and actively manage risks.

Therefore, the minimum capital requirement (MCR) is set up, which has been increased in order to cover all possible risks. Its calculation formula, as well as the other qualitative indicators, are provided in the legislation for implementing the solvency regulations II (According to the regulations, the Minimum Capital Requirement (MCR) is calculated based on the formula: $MCR = \max(MCR_{\text{combined}}, AMCR)$ - Law 237/2015, $MCR_{\text{combined}} = \min(\max(MCR_{\text{linear}}, 0.25 * SCR); 0, 45 * SCR)$, where SCR is the Solvency Capital Requirement (Delegated Regulation 2450/2015).

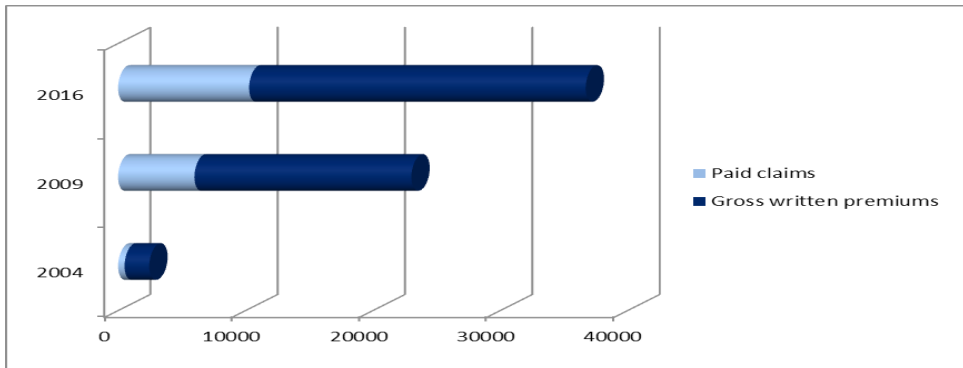
In the same context, the Solvency Capital Requirement (SCR), which represents the sum of the funds that the insurance and reinsurance companies in the European Union must have, is also established. It is based on a value-at-risk (VaR) calibrated formula at a 99.5% confidence level, which takes into account all quantifiable risks, including general underwriting, life underwriting, health underwriting, market, credit, operational and counterparty risks and covers both existing and new business during 12 months, being recalculated at least once a year.

The rates regarding the requirements of the solvency capital requirement (SCR) and those regarding the minimum capital requirements (MCR) on the Romanian insurance market were supraunitary at the end of 2016, as shown in the The Financial Supervisory Authority Report (2016, p. 27), indicating that the insurance market did not face an insolvency risk situation.

2. ABC Insurance –Reinsurance

ABC Insurance-Reinsurance is an insurance company established in 1997, with a fully Romanian share capital. In 2000, the regulator at that time—the Romanian Insurance and Reinsurance Activity Supervisory Office (OSAAR)—requested an increase in the company’s capital, which was the reason behind the subsequent diversification of its shareholding. This company’s object of activity is the conclusion of non-life insurance policies, and since 2005 (ABC Insurance, 2018), the company has been authorized to offer compulsory civil liability insurance policies for car owners (Ro: RCA), thus becoming a member of the Romanian Automotive Insurers’ Bureau (BAAR) in 2006. During the analyzed period, 2004-2016, the value of the indemnities and gross written premiums registered an ascending trend, as shown in Figure 1.

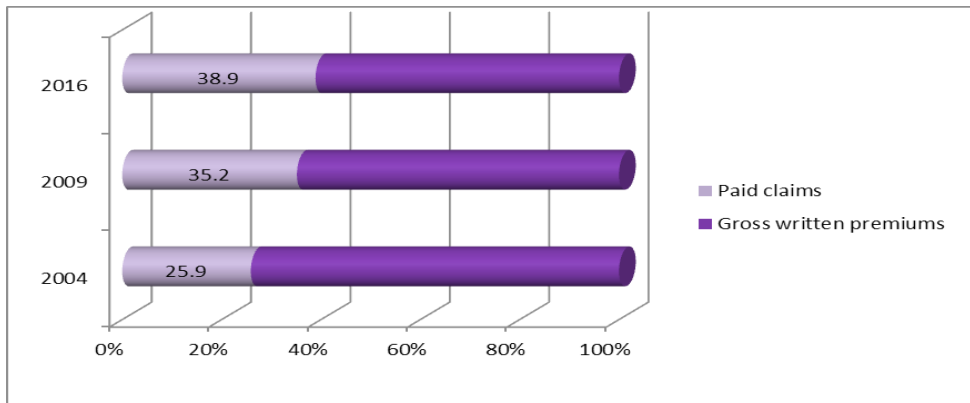
Figure 1. The paid claims and gross written premiums to ABC Insurance-Reinsurance (thousands lei RON)



Source: Data extracted from CSA- Annual Report 2004 and Annual Reports of ABC Insurance –Reinsurance Company (2009, 2016, 2018), (ASF, 2016)

The gross indemnities paid by ABC Insurance-Reinsurance in 2004 were 25.9% of the gross written premiums, the ratio reaching 35.2% in 2009 and 38.9% in 2016 (Figure 2).

Figure 2. The share of paid claims in gross written premiums for ABC Insurance-Reinsurance (%)



Source: Our own calculations based on data extracted from CSA - Annual Report 2004 and Annual Report of ABC Insurance - Reinsurance Company (2009, 2016) 2018), (ASF, 2016)

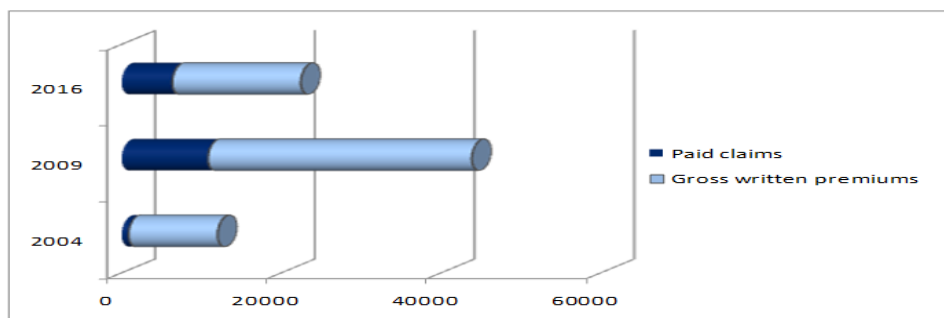
This company’s net profit has shifted over the years, also reaching negative values, with losses of hundreds of thousands of Ron in 2006 (Ron 773.7 thousand), in 2011 (Ron 395.5 thousand) and in 2013 (Ron 262.9 thousand).

Starting with 2015, the company management decides to withdraw the company from the RCA market, and changes the development strategy in order to obtain profit. At the end of 2015, the company earns the highest gross profit since establishment, namely Ron 2.3 million, followed in 2016 by a 30% decrease in profit compared to 2015. In order to meet risk management conditions (Solvency II), in 2016, ABC Insurance-Reinsurance (Müller Report, 1997) has a registered and paid up share capital of Ron 19.7 million, owning sufficient capital pursuant to SCR (Solvency Capital Requirement) and MCR (Minimum Capital Requirement), resulting in a solvency ratio of 1.57 (Order no. 3105/2005). Of the companies selected for analysis, ABC Insurance-Reinsurance is the smallest, which gives a realistic picture of the ample range of the most long-lived players on the Romanian insurance market between 2004 and 2016.

2.1 ASITO KAPITAL S.A.

Insurance-reinsurance company established initially as Lukoil Asito in 1998, with the purpose of supporting the Romanian businesses and securing the Romanian assets of the Lukoil oil group. In 2011, 99% of the company is taken over by the Moldavian company Moldasig, for the amount of \$3.1 million paid to British company Norcross Insurance Company Limited, and changing the name to Asito Kapital. The main objective of the insurance products offered by this company is to support various companies in their businesses by streamlining their investments and increasing their sales. The type of insurance policies they provide are general in nature. This company's written premiums registered spectacular changes, as shown in Figure 3.

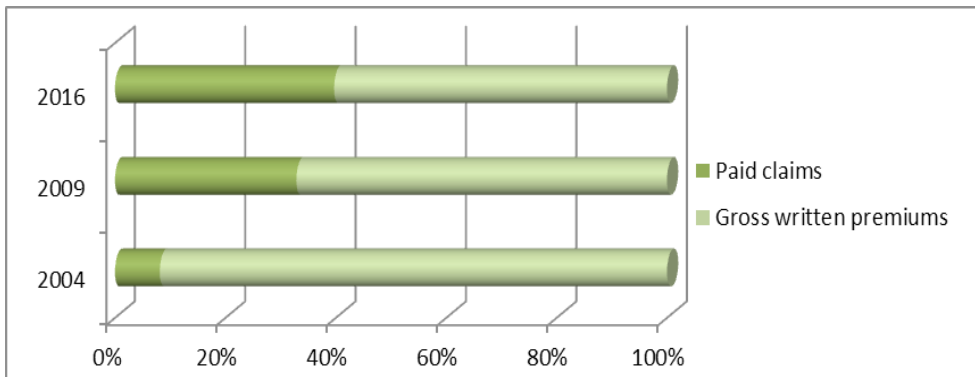
Figure 3. The paid claims and gross written premiums (thousands lei RON)



Source: Data extracted from CSA- Annual Report 2004 and Annual Report of Asito Kapital Company (2009, 2016), (ASF, 2016)

Gross indemnities paid in 2009 were 32.9% of the gross premiums written that year, but in 2016, in the context of a decrease in both gross written premiums and indemnities, the share of indemnities increases to 39.7 % (Figure 4).

Figure 4. The share of paid claims in gross written premiums from Asito Kapital (%)



Source: Our own calculations based on data extracted from CSA - Annual Report 2004 and Annual Report of Asito Kapital Company (2009, 2016), (ASF, 2016)

The company's net profit was RON 0.7 million in 2004; however, not all years were profitable: in 2009, the company registered losses of Ron 1.6 million. The only other negative year in the studied period was 2013, 28% lower than 2009, while the other years brought positive values until 2016. The 2016 deficit was Ron 1.35 million.

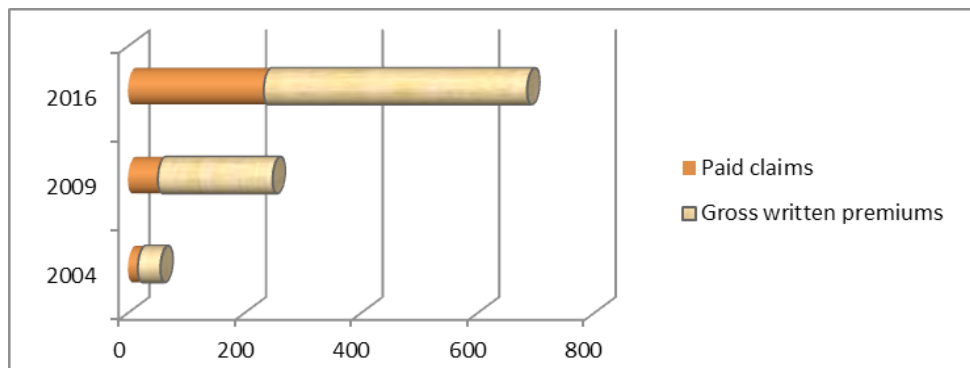
In this context, in 2015 the company was selected by the Financial Supervisory Authority for the assessment of its solvency and for verifying its compliance with the conditions imposed by the Solvency II framework. Initially, based on the balance sheet data up to 2014, Asito Kapital did not meet the Minimum Capital Requirement (MCR). The company management started a process in view of increasing the company's share capital by \$1.35 million before the end of 2014.

This company's capital increased by 43% in 2015 compared to 2014, followed by another increase of 12.7% in 2016 compared to 2015, reaching Ron 20.6 million. Starting with 2016, the conditions imposed by Solvency II are met, with a SCR (Solvency Capital Requirement) of Ron 19.8 million and a MCR (Minimum Capital Requirement) of Ron 17 million.

2.2 Carpatica Asig

The company was established in 1996 under the initial name ASA Asigurari Atlassib, which was changed to Carpatica Asig in 2004. The evolution of the gross written premiums and gross indemnities paid (Figure 5) is due to the company's development strategy, especially in 2009, consisting in the promotion of compulsory RCA insurance policies. Between 2008 and 2009, Carpatica had a 15% share of the motor vehicle insurance market, the second player on the market after Euroins.

Figure 5. The paid claims and gross written premiums to Carpatica (millions lei RON)

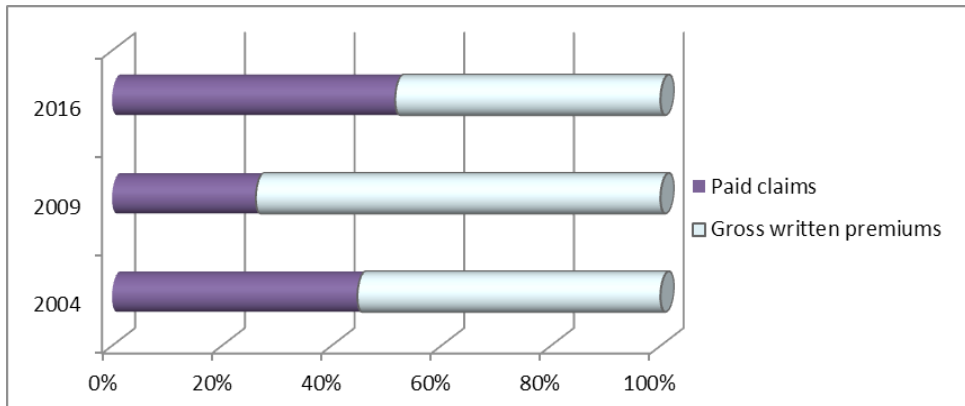


Sources: Data extracted from CSA- Annual Report 2004, Annual Report of Carpatica Company 2009, (ASF, 2016)

Carpatica is considered an aggressive player on the RCA insurance market; its revenue has increased, but also its losses. The gross indemnities paid in 2004 amounted to Ron 17.3 million, accounting for a 44.8% share of the total subscribed premiums, which was fairly high at that time (Figure 5, Figure 6).

Gross indemnities paid in 2009 were 26.2% of the gross premiums written that year, and in 2016 (The Financial Supervisory Authority -ASF, 2016), in the context of an increase in gross written premiums as well as indemnities, the share of indemnities increases to 51.7 % (Figure 6).

Figure 6. The share of paid claims in gross written premiums for Carpatica (%)



Source: Our own calculations based on data extracted from CSA- Annual Report (2004), Annual Report of Carpatica Company (2009), ASF (2016)

In this context, Solvency I requirements were not met by the Carpathians at the end of 2015, when it recorded an equity gap of Ron 690.4 million. In 2016 Carpatica remained in the negative segment of the requirements, with a further equity loss of Ron 613.7 million and a solvency margin of Ron - 615 million, with a sharp deterioration of its financial indicators. These conclusions are based on Mazars' 2015 Financial Audit Report, recognized by the Financial Supervisory Authority (ASF), followed by the Deloitte Assessment Report. According to the new Solvency II requirements, Carpatica does not meet MCR (Minimum Capital Requirement) and SCR (Solvency Capital Requirement), resulting in the need of a Ron 900 million capital injection. The company attempted unsuccessfully to solve its financial issues by trying to attract investors approved by the Financial Supervisory Authority (ASF) between 2015 and 2016.

From the Deloitte Report and the Compliance Report drawn up by the Policyholders Guarantee Fund (FGA), the Council of the Financial Supervisory Authority (ASF) concluded that resolution instruments (Müller Report, 1997) are not applicable and terminates the recovery procedure, ascertains insolvency and initiates Carpatica's bankruptcy procedure (Decision 1498 / 27.07.2016), the process being concluded with the withdrawal of the company's operating license as of 27.07.2018.

The Financial Supervisory Authority (ASF) collaborated with the Policyholders Guarantee Fund to protect the interests of Carpatica policyholders and to support the stability and functionality of the insurance system. Carpatica's bankruptcy follows the resounding bankruptcy of Astra insurance company, with businesses of over Eur 200 million a year.

3. Conclusions

At the level of 2016, due to the requirements of the solvency regime II, there was an additional capitalization requirement of 1.2 billion lei in the insurance market, about 16% of the volume of gross premiums subscribed in 2015. In the same context, the indicator Solvency Capital Requirement (SCR) of the insurance companies increased by about 8% as a result of the growth of the total assets of the insurance companies (The Financial Supervisory Authority -ASF, 2016), Solvency II implementation in Romania has generated a number of problems for most insurance companies, for small and medium-sized companies, especially monoline insurers, as in the case of the three companies analyzed in this study, which were among the most vulnerable.

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THE CONDITIONS OF EMERGENCE OF KNOWLEDGE WORKERS ILLUSTRATED THROUGH THE CASE OF AN OIL COMPANY

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Abstract: *The advent of the knowledge society and the ubiquity of information and communication technologies summarize current developments in the business environment and express the theoretical and organizational challenges. Now, more managerial studies insist on the importance of knowledge management as the new approach for the development of work based knowledge. Precisely, this new discipline in construction can be apprehended by two approaches: a technological approach and a social approach, as it will be presented in the first part of this paper. In the second part, the presentation of the case of an oil company will help us to highlight, on the one hand, the limits of the technological approach to emerging practices of knowledge workers, and on the other hand, the major importance of aspects such as the sharing culture and trust.*

Keywords: *knowledge management, ICT, MASK method, Sharing culture, perception, KM Mix, knowledge workers, oil company*

JEL Classification: *M15, L6*

1. Introduction

The advent of the knowledge society and the ubiquity of information and communication technologies are recurrently the main managerial publications and academic titles. The two expressions summarize indeed current developments in the business environment and express the theoretical and organizational challenges.

Therefore, everything is changing. Information and knowledge to replace capital and energy as a major creative assets of wealth, in the same way that they had replaced agrarian property and labor two centuries earlier (Jean-Paul Pinte, 2006). Furthermore, technological advances of the twentieth century have transformed most of the creative work of wealth to a “less physical” basis “more intellectual” base (Drucker, 1993). Indeed, Foray (2000) has highlighted how the tangible capital/intangible capital report of usfirms that has evolved from 1.72 to 0.87 during the period 1929-1990. These studies all especially the importance now given to non-financial investments, including for the acquisition of new knowledge, learning and ICT.

Now, more managerial studies insist on the importance of knowledge management as the new approach for the development of knowledge work in companies. Precisely, this new discipline in construction phase can be apprehended by two approaches: a technological approach and other managerial, as it will be presented in the first part of this paper. In the second part, the presentation of the case of the oil company will help us to highlight, to one side the limits of the technological approach to emerging practices of knowledge workers, and on the other hand, the major importance of aspects such as the sharing culture and trust.

2. Knowledge Management According to Two Approaches

2.1. Some Definitions of Knowledge Management

On the data collected from the Compendex database, observed that from 2000 to 2004, the number of publications on the topic of KM made that grow from a little more than 200 publications in 2000 to more than 700 publications in 2004. Since 2005 there has been a slight decline in publications. For its part, the Web of Science database indicates in 2006 a 4% increase over 2005 publications (192 publications against 141). ISI Proceeding note it a slight decline (112 publications against 139). Overall it seems that the trend is continued growth of the publications on the KM. However the analysis of the evolution of the treatment of the themes associated with the KM, suggest that the year 2005 marks the passage to a second type of research on the subject, on themes related to the managerial aspects and social km. Nevertheless, the US is the largest producer of articles on the topic with more than 40% of global publications, (Dudezert, 2007).

Knowledge management literature has allowed us to identify a large number of definitions of knowledge management. In the following table, we just present some. The reading of these definitions well clearly identified the existence of two currents of knowledge management, as will be explained below.

Table 1. Some Definitions of Knowledge Management

Author(s)	Définition
Tounkara, 2002	“Managing knowledge business is to implement processes of capitalization, learning and creation, interaction to identify critical knowledge for the company, to preserve, develop and to advance.”
Prax, 2000	“Knowledge Management is a process of creation, enrichment, capitalization and dissemination of knowledge that involves all stakeholders and the Organization, as consumers and producers.”
Rossett, 1999	“Knowledge management involves recognizing, documenting and distributing explicit and tacit knowledge in order to improve organizational performance.”
Tissen, Andriessen et Deprez, 1999	“Knowledge management is the process of linking your company’s knowledge to your business strategy , designing knowledge supportive organizational structures , and breeding knowledge professionals.”
Massie, 1998	“Knowledge management is a systematic process of finding, selecting, organizing and presenting information in a way that improves an employee’s comprehension in a specific area of interest.”
Ernst & Young, 1997	“Knowledge management is a framework or system designed to help companies capture, analyse, apply and reuse knowledge in an effort to make faster, smarter and better decisions .”
Grundstein, 1995	“Capitalize the knowledge company it is consider knowledge used and produced by the company as a set of resources constituting a capital, and draw interest contributing to increase the value of this capital.”

Through the reading of these definitions we notice the existence of two approaches to the knowledge management: “managerial” approach and “technological” approach. The first approach focuses on the “personalization of knowledge” and the second one on the “codification of knowledge” European Commission, (2004), Grundstein, (2003), Bayad and Simen, (2003), Fernandes, Raja Hansen (2000), Hansen, Nohria and Tierney, (1999).

The managerial approach was developed by consultants (Davenport, Sveiby, Prax, Stewart) and managers. This approach stresses the existence of a strong link between knowledge and the person that created, or that incorporates. This approach, with an emphasis on the establishment of a corporate culture based on good communication, where everything is designed and made to encourage the sharing of knowledge between individuals of the same community, States that knowledge is primarily shared through personal contacts. For followers of this current thought, it is to strengthen the communication of knowledge between people, and not to store knowledge.

The technological approach developed by practitioners (consultants and computer’s managers), focuses on capture, coding and storage of knowledge in databases. Knowledge must be stored in archives and the EDM (electronic data management systems) in a manner accessible to everyone. They consist of an elaboration of knowledge on informational support, followed by a classification to a subsequent operation. This explanation is based on predefined models informed by “bearers of memory” or experts. Remember that only the information here may be stored and that, whatever the approach, the information that will help reactivate and stimulate knowledge.

The following table traces a few differences between the two approaches (European Commission, 2004).

Table 2. Two Approaches of Knowledge Management

The Technological Approach	The Social Approach
Focuses on technology	Focuses on the human and culture
Knowledge is an object	Knowledge is a process
Knowledge can be classified, structured and shared	Knowledge is created through organizational learning and the evolution of the process

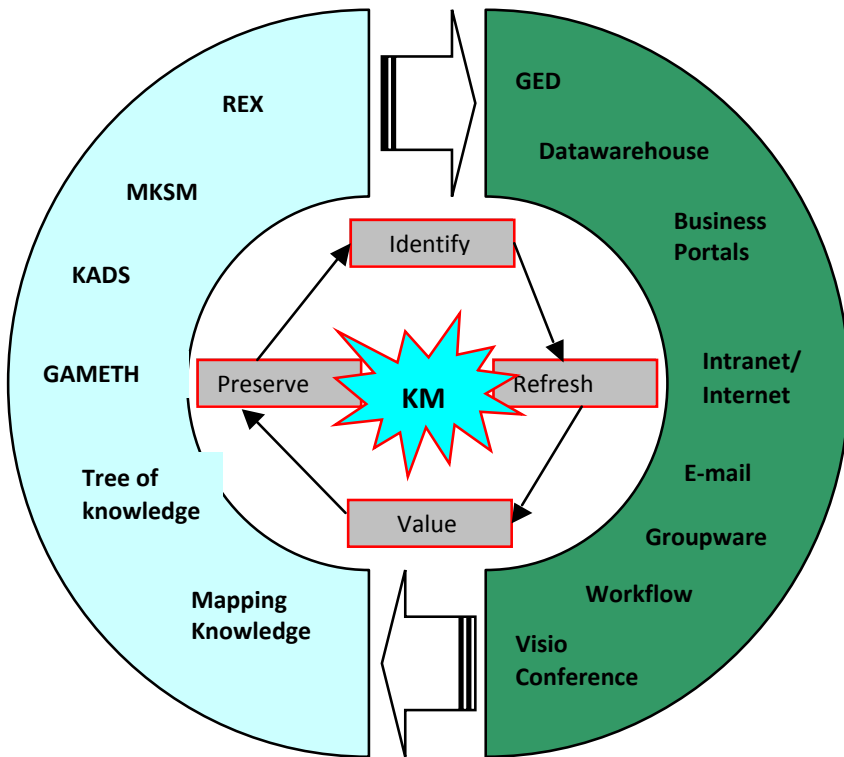
Mathematical description of the information and knowledge	Social construction of information and knowledge
Technological determinism (inevitable impact)	It is the man who uses and controls technology
Knowledge included in formal processes and functions of the Organization	Knowledge included in informal process
Knowledge management as a separate discipline or as a component of information technologies	Knowledge management as essential part of the capacity organizational (but difficult to isolate in terms of players and routines)
Knowledge management initiative and program based on technology standards	Knowledge management as an organic system based on creative relations, constructive activities and social behavior
Knowledge management as a program to monitor and implement by executing	Knowledge management as a whole related to strategy and vision and prospects of top management

2.2. The Technological Approach of Knowledge Management

The mechanisms of creation of new knowledge in the technological approach are materialized through the verbs “acquire”, “retrieve”, “structure”, and “disseminate” knowledge, allowing, on the one hand, methods and tools for the collection or acquisition, knowledge extraction, the structuring of knowledge and the dissemination or sharing of knowledge, and on the other hand, the use of new information and communication technologies.

The capitalization knowledge process implies the prior identification of the knowledge and skills to capitalize. The use of methods of knowledge such as: KADS, MKSM, REX, CYGMA and GAMETH is an indispensable step for the establishment of a knowledge management approach focused on the computer. In fact, the methods perform with computer tools in the process of capitalization of knowledge. Both forge this approach. The following figure illustrates better our words and clearly highlights the two dimensions of KM’s technological approach.

Figure 1. Technological Knowledge Management Approach



The reading of this figure gives the impression that the fact of introducing technologies for knowledge management, information shared by default and the sharing of knowledge will gain ground. It would be a real technological determinism. However, be limited to technological considerations cannot suffice. It's also to consider strategic, organizational, and cultural dimensions. This is precisely what is proposed to treat the managerial approach.

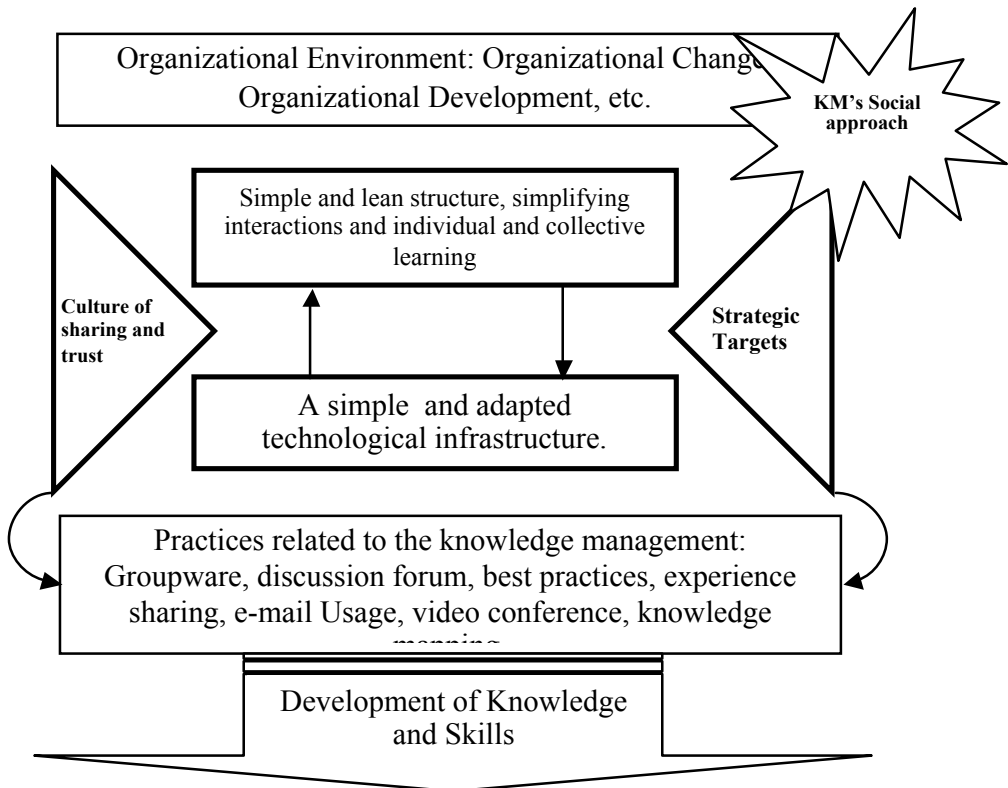
2.3. The Social Approach of Knowledge Management

To meet the challenges of knowledge management, Edvinsson et al (1998), Teece (1998) and Earl (2001) advise companies to define a theoretical framework to structure their approach to knowledge management upstream. For several years, many companies have begun to structure their approach to knowledge management. It is obvious that the effective implementation of these programs raises many problems associated, sometimes with the tacit nature of knowledge (Davenport and Prusak, 1999), or the existence of cultural

barriers (O'dell and Grayson, 1998), sometimes to the adoption of a system of knowledge management((Lancini, 2003). Many authors (Choi and Lee, 2002;) Davenport and Prusak, 1999; (Earl, 2001) argued that knowledge management practices are often not connected and there of many levers influencing the performance of any particular style of knowledge management.

Now, through the managerial approach, emphasis on the importance of the definition of the components of the portfolio of knowledge, the actions of dissemination of a culture of sharing, the establishment of a climate of confidence and the efforts of establishment of a structure dedicated to the knowledge management. Similarly, register all in a vision of organizational change full appears now as essential. The following figure is highlighted all of the aspects to be taken into considerations in projects of knowledge management. The second part of this paper will be reserved for the presentation of the project of knowledge management at the level of the Algerian oil company Sonatrach, through its technological and social aspects.

Figure 2. The Ingredients of the Mix of the Knowledge Management, Benabou and Bendiabdellah (2005)



3. Rise and Limitation of the Knowledge Management in SONATRACH

3.1. Presentation of the Company

Sonatrach is an Algerian company research, exploitation, transportation by pipeline, processing and marketing of hydrocarbons and their derivatives. It occurs also in other sectors such as electricity generation, new and renewable energy and desalination of sea water. It exercises its functions in Algeria and in the world where opportunities arise. Sonatrach is the first company of the African continent. It is ranked 12th among world oil companies, second exporter of LNG and LPG and third exporter of natural gas in the world. Its total production (all products alike) was about around 222 million toe in 2004. Its activities comprise approximately 30% of the GNP of the Algeria. It employs 120,000 people in the whole of the group.

The Sonatrach group around its trade adopted principles of organization and operating logic, with a strength of the capacity of the branch in terms of development strategies, by relying on effective decentralization and simplification of the operation. Operational activities are the trades of the Group and develop its potential business both at local and international level.

3.2. Presentation of the KM Project at the Company

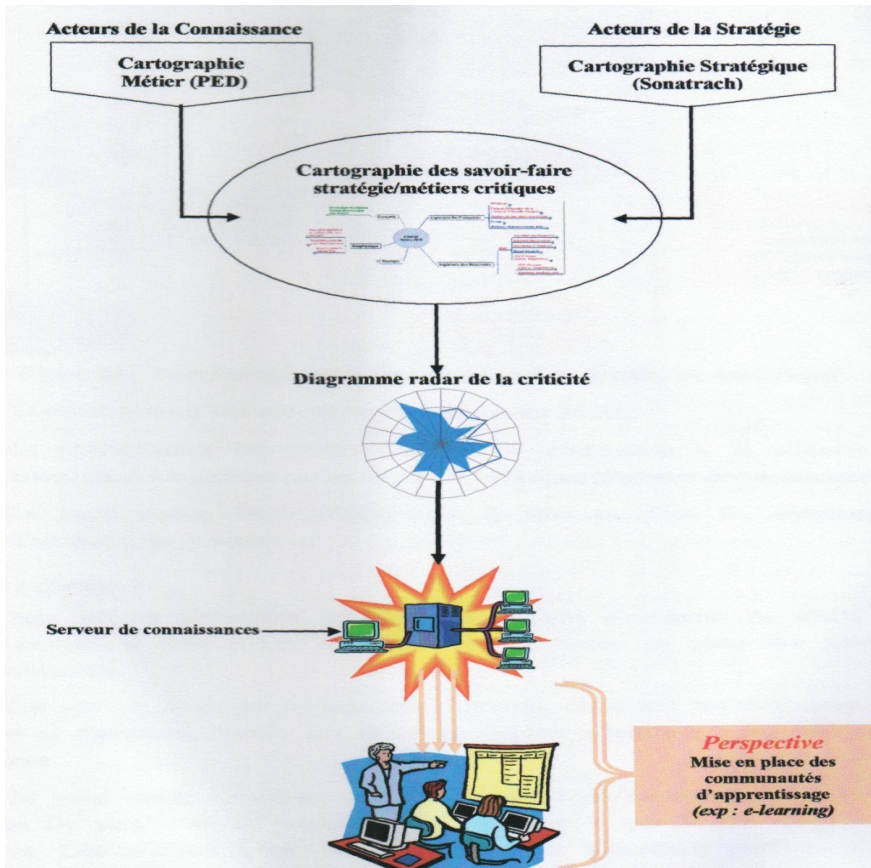
Knowledge management project is considered by the General Directorate of Sonatrach as a strategic project. It is based on an overall vision erected at the level of the company and local, concrete actions and to generate visible benefits in the short term, the objective of preserving the heritage strategic knowledge, developed over the years, is a priority for the group. The issue is more important, when you know that Sonatrach has experienced a great start to retirement and an important recruitment of young people.

Sonatrach, the basic elements of knowledge management are the collaborators (those who create and share knowledge) and information system (that stores, processes and makes available the information). Moreover, the knowledge management is displayed as a tool for the future and powerful Sonatrach Corporate University (SCU). The method chosen is more top down than bottom up. It takes the high starting point. It sets the aim of a mapping of strategic skills and, on the other hand, a mapping of the critical business characteristics.

This mapping consists of trees for a hierarchical view all useful knowledge. Following a cross-analysis of two types of skills, we can identify

both critical and strategic skills that require a capitalization, sharing and transfer. The following figure shows the overall process of management of the knowledge of the company.

Figure 3. The Steps of Sonatrach KM Approach



Such knowledge modeling presented by the method of MASK (Ermine, 2003), and other techniques of knowledge engineering, to identify critical knowledge. The company has opted for the delimitation of the heritage of knowledge, by choosing a structure that is an essential node in the upstream activity and therefore which includes strategic trades skills. Therefore, the PED (Petroleum Engineering & Development) division was chosen as entity pilot to operating this project. The final phase of the project is to design devices (as knowledge servers) and to perform, then a teaching Screenwriting models of knowledge.

This server of knowledge remains a technically securable, accessible and easy to develop by actors trades (knowledge workers) way.

In the first stage of the project, experts have used a representation and modeling tool: mapping, based on the concepts of “Mind Mapping” by using the software Mind Manager which is based on the concepts of mind mapping. It’s thus draw, manage and manipulate mental maps to better manage projects, or to communicate ideas to colleagues and partners. Mind Manager adds the concepts of mind mapping by associating with the maps produced a set of powerful features to export maps to the file formats Ms-Word, Ms-PowerPoint, Ms-Project, from web sites and additional information (texts, symbols,... structured information)... these features make it a powerful tool for management of information and preparation of documents. It is designed to facilitate the expression and sharing of ideas and data between the collaborators of the company. It enables teams to synchronize phase through their action plans, making them more clear and shareable.

This tool is used on various occasions: representation of the strategy, strategic skills representation, representation of critical skills, etc. The mapping is a representation for a cognitive navigation using a hierarchical visualization of the heritage of knowledge subject of study.

Field work carried out, took four forms:

- Collective sessions bringing together the persons concerned by the issue to discuss;
- Individual interviews with a sample of persons involved in the various processes;
- Interviews with the managers for elaboration of the elements of the strategy;
- Finally, work on reference material.

Mapping of trades PED and analysis of criticalness. The critical of a domain is an assessment of the risks/opportunities that presents the domain for the company. The approach at Sonatrach followed two approaches:

- Realization of the map of the areas of knowledge,
- Adoption of a grid of criticality of knowledge.

The assessment of the criticality of a domain is to assign a score according to each criterion for each domain. Over the domain is critical, more note is high, more a more particular concern will be reserved. Each area was evaluated independently of others. The return of results for each domain is synthesized graphically in a radar chart. On the basis of this study, a mapping

is made. It determines the most critical areas (red colour indicates maximum criticality). At this point the computer approach of the KM for Sonatrach has a mapping of the critical business skills.

The capitalization of knowledge involves several phases: identification, formalization, dissemination and updating. In the part of the identified as critical and strategic expertise, much remains still implied among players in the trade. For the latter, this tacit character is a determining factor of criticality. To do this, the KM project team has implemented a process of elaboration on the critical and strategic domain identified in the previous phase. This process is based on a knowledge management server.

In technical terms, it is possible, depending on the chosen user type to access the sub - domain corresponding criticality, and functionality required by the appropriate level of expertise. An example of a navigation interface is presented under the appearance of a dynamic website with privileged access. For example, the heading "Documents booth" to file documents considered as crucial for the activity of the DEP division. Unfortunately, so far on recourse to the deposit of documents on the site.

It is clear that this mapping approach, is the identification of knowledge (census of the areas of knowledge, holders of expertise location, etc.), the criticality of the heritage of knowledge (audit) evaluation/analysis and visualization of knowledge critical and aligned to the strategy of Sonatrach. This allowed to identify skills trades affected by this strategy, and therefore the areas of knowledge to support and/or develop by transfer actions through, inter alia, funding and learning. The limited sharing of documents, experiences and good practices by the actors of the company helps explain the relative failure of the computer approach by questioning of the managerial, including organizational culture aspects.

3.3. The Explanation of the Limits of the Project by the Assessing the Social Elements

Despite all the beneficial and positive points that we are going to expose, we blame this approach too technical character and passing under silence of several aspects that we consider more important than the computer approach presented above, without Demystifying of course the great effort provided previously by officials and consultants at Sonatrach. Now many issues arise, notably the ability of employees to share their knowledge, their commitment to the change required to operate, the adaptation of the project organizational features

and existing processes, the system of motivation which must accompany the approach the mechanisms of learning to establish the diagnosis of the atmosphere of trust., .etc. Specifically, a more intangible level of analysis will be targeted in what follows, including by highlighting of perception employees of the important issues of KM.

3.3.1. Perception of the Employees of the Issues of Knowledge Management

We conducted an investigation with Sonatrach, to spot the light on the perception of employees of the importance of knowledge management and actual concerns granted to this issue. We distributed 500 questionnaires directly, through family members or students and by E-mail. Finally, we recovered 180 questionnaires, only 144 were considered to be exploitable, wich represent a rate of 28.8%. Distribution of respondents in main socio-demographic variables are detailed as follows: Women (36%); Age between 21 and 30 years (38.7%), between 31 and 40 years old (38%), more than 40 years (23.3%); Education: College (10.2%) secondary (32.3%), University (57.5%); Experience at work : less than 5 years (20.6%), from 5 to 10 years (27.6%), from 10 to 15 years (24.4%) and more than 15 years (27.4%).

The important areas of knowledge management. The various items discussed in this aspect are presented in the following table:

Table 3. Presentation of the percentages of the benefits covered by the KM

1. Add the knowledge about the customers	29.9 %
2. Promote a dynamic change and improvement	29.9 %
3. Deploy the sharing and the collaboration	29.2 %
4. Develop innovation (products, services).	25 %
5. Improve the quality of products/services	24.3 %
6. Develop Skills	22.9 %
7. Ensure a relevant watch on its environment.	22.2 %
8. Protect the intellectual capital of the company	20.8 %
9. Improve productivity	18.1 %

Knowledge Management appears clearly as an indispensable mean for employees to better manage the company's customer relationships capital and deepen the knowledge on customers. Particular importance is given by the

employees to the sharing, the collaboration and the change. This may reflect a sense of hope for the project of the KM as a means of realization of the collaboration, sharing and the change to a more advanced stage.

The classification of the protection of the intellectual capital to the front last place reflects a lack of awareness on the part of the top management to the major issues of the KM approach. Now, we will examine key factors of knowledge according to the perception of the employees.

The key Factors of knowledge management. For the majority of respondents, the success of knowledge management is primarily based on trust, sharing and collaboration culture. This item exceeds that of a suitable internal technological climate. Comes in third position the expression of a long-term strategic commitment, attitude which reflects the concern of the employees, to see the direction of the Sonatrach Group consider this revolutionary approach of management, as a mere fad. The following table shows the different percentages for each item.

Table 4. Percentages of the Key Factors in Knowledge Management

1. The Culture of the Company (based on trust, sharing, collaboration)	53.5 %
2. A suitable internal technological climate	36.8 %
3. A strategic commitment on long-term	34.7 %
4. Structure and processes clear and responsive to the management of knowledge	31.3 %
5. a system of reward for each contribution	31.3 %

If a thing is to remember of this study is the less priority given by the responders to the technological tools comparing to the culture . The particular interest granted by collaborators to the concepts of : trust, sharing and collaboration, led us to ask ourselves about the nature of the dominant culture in the Sonatrach. This is what we will see now.

4. Conclusion

In conclusion, the following table resumes the whole aspect developed in the second part of this paper. It reveals the lack of interest displayed by the top management of the Sonatrach for the strategic importance is to integrate the KM project by the use of technological tools taking into account the company managerial aspects. As such, the cultural diagnosis showed a deficit in the future.

Table 9. Level of consideration granted to two approaches of KM in Sonatrach

Technological Approach of Knowledge Management		Social Approach of Knowledge Management	
Approach aspects	Degre of Importance	Approach aspects	Degre of Importance
Philosophy: knowledge is an object that can be standardized, classified and shared. Focused on technology.	Strong	Philosophy: knowledge is created through organizational learning and the evolution of the process. Focused on human and culture.	Low
Methodology of knowledge capitalization	Strong	Managerial and social Dimensions	lesslow
MASK	Strong	Knowledge management as a whole related to strategy and vision and prospects of top management.	Strong
Mapping of the Know-how of the employees	Strong	Knowledge management included in informal process.	Low
Usage of the Criticality Grid to identify the company's strategic knowledge	Strong	Involvement of the employees and their preparation for the change.	Low
Usage of the technology tools	Strong	Knowledge management related work to the diagnosis of the Organization	Low
<ul style="list-style-type: none"> ▪ Intranet 	Strong	Knowledge management related to the nature of organizational culture	Low
<ul style="list-style-type: none"> ▪ Mind Manager software 	Strong	Knowledge management related to the work climate and the reigning degree of trust.	Low
<ul style="list-style-type: none"> ▪ Document kiosk, directories,... Etc. 	Strong	Adapted technology infrastructure.	Strong

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THE QUALITY OF THE MANAGEMENT AND THE NEED OF REFORM IN PUBLIC ADMINISTRATION. SOCIO-ECONOMIC FACETS OF LIVING CONDITIONS IN ROMANIA

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Abstract: *In 2019, four major cities from Romania were included in the world quality of life ranking: Cluj-Napoca, Timisoara, Iasi and Bucharest (it is a ranking that includes 226 cities, in which the first place is positioned Canberra, while the last place is occupied by Caracas). The quality of life index used represents an estimate of the overall quality of life by using an empirical formula that takes into account eight indicators: the purchasing power index, the pollution index, the ratio of the price of housing and income, the cost of life index, the safety index, the health care index, the transport time index and the climate index. It should be stressed, however, that on the one hand, in any process of measuring the quality of life are used not only the objective indicators, which describes the conditions of life, but also the subjective indicators, which assess the state of life through a perception „filtered by expectations, aspirations, values”, who rather targets the happiness, the satisfaction with life. On the other hand, the concept of quality of life is a multidisciplinary one, its definition being a wider one if we think about the multitude of indicators that should be used. The present article proposes only a description of the housing conditions in Romania in the European context, using the latest statistical data who directly affecting the living conditions of the Romanian population.*

Keywords: *degree of urbanisation, dwelling type, housing affordability, housing conditions, living environments, material living standards, objective indicators, overcrowded rate, subjective indicators, the climate index, the pollution index, the ratio of the price of housing, the safety index, quality of life*

JEL Classification: *A14, I32*

1. Quality of living

When discussing issues related to the quality of living, we do not think only of the insured utilities or their quality. The concept integrates a multitude of aspects that complements with the construction of a habitat where the civilized individual of the modern world is trying to assemble a balanced environment of his living conditions.

On the one hand, this also explains why in the housing quality assessments we encounter data concerning aspects related to the structure and infrastructure of the house: the quality of the roof of the dwelling or walls, the lack of space (overcrowding), the existence of basic utilities (water and gas, electricity), the presence of sanitary facilities / bathrooms in the house.

On the other hand, such assessments may extend the analysis framework to data related to the residential context (the area where the dwelling is located): how much noise (ambient noise) is around of the area we live in, how large are the values of the atmospheric pollution or how safe is in the area we live in.

We can illustrate with some examples from 2016 the ones outlined above as follows:

- On average, about 16.6% of Europeans lived in an overcrowded home;
 - Higher levels of overcrowding have been declared for eastern and southern European (EU Member States) and especially in urban areas.
- About 15.4% of the EU-28 population reported in 2017 that it lived in a dwelling with major infrastructure problems;
- 8.7% of the EU-28 population was unable to ensure their home warm in the cold season;
- 17.9% of Europeans complained about the high levels of noise pollution, 14% of pollution and about 13% of violence or vandalism;
- 11.1% of Europeans allocated more than 40% of the available income for housing (in Greece, 40.5% of the population was in this situation in 2016).

1.1. Housing conditions

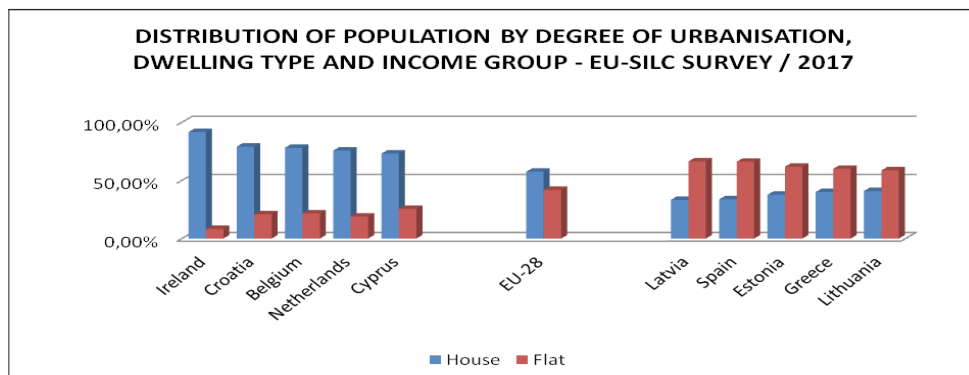
„In the context of material living standards and well-being” housing is one of the most important characteristic. Practically, each individual would like to afford:

- Adequate housing of decent quality,
- In a safe environment,
- Adequate space “for its occupants to live, eat and sleep”.

Here are the main features of living in the EU-28 area according to Eurostat data of 2017, for the UE-28 population:

a. Europeans tend to live more in houses than in flats

Figure 1. Distribution of population by degree of urbanisation, dwelling type and income group



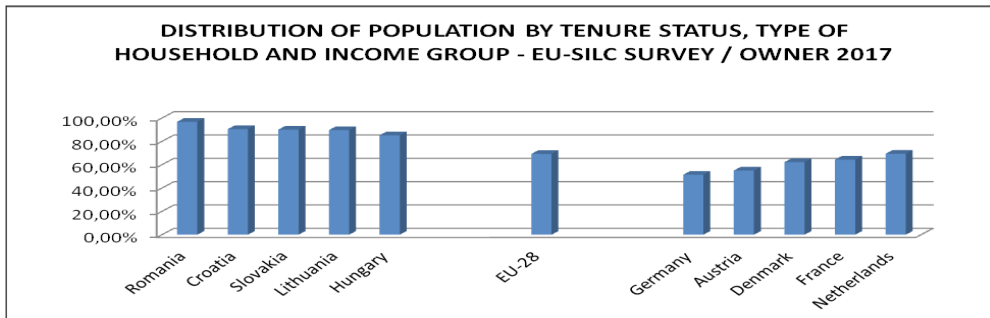
Source: Ec.europa.eu (2017a)

- In 2017 the distribution of the UE-28 population was as follows: 41.7% in urban areas, 27.3% in rural areas and 31% in towns and suburbs;
- 57.50% of the EU-28 population lived in 2017 in houses (41.9% in flats);
 - The highest values was recorded in Ireland, where only 8,3% of population live in flats.
- The smallest values were registered in the Baltic countries, Latvia ranks the top - 66.4% of population live in flats;
 - **Romania** finds itself in the current European trend, **65.9% of population lived in houses in 2017, while 34.1% in flats.**
- 16.2% of the EU-28 urban population lived in houses in 2017;
- **In 2017, only 5.8% of the urban population in Romania lived in houses.**

b. Generally the european population lives in owner-occupied dwelling

- 69.3% of the EU-28 population lived in 2017 in an owner-occupied dwelling, while 30.7% were tenants (42.8% owners with documents + 26.5% mortgages or borrowed);
- **Romania ranks first in the European Union in terms of the percentage of the population living in an owner-occupied dwelling – 96,8%** (Croatia – 90.50%, Slovakia – 90.10%, Lithuania – 89.7% and Hungary – 85.20%);
 - To the other pole were Germany – 51.40%, Austria – 55%, Denmark – 62.20%, France – 64.40% and the Netherlands – 69.40%;

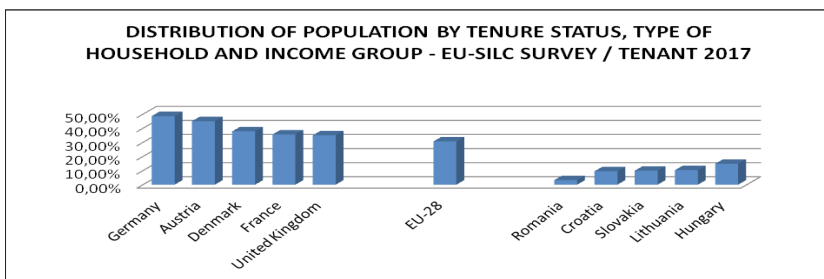
Figure 2. Distribution of population by tenure status, type of household and income group



Source: Ec.europa.eu (2017b)

- **In Romania, approximately 3.2% of the population lived with rent in 2017;**
 - To the other pole was Germany with the highest values – 48.6% (Austria – 45%, Denmark – 37.8%, France – 35.6%, Great Britain – 35%).

Figure 3. Distribution of population by tenure status, type of household and income group / Tenant



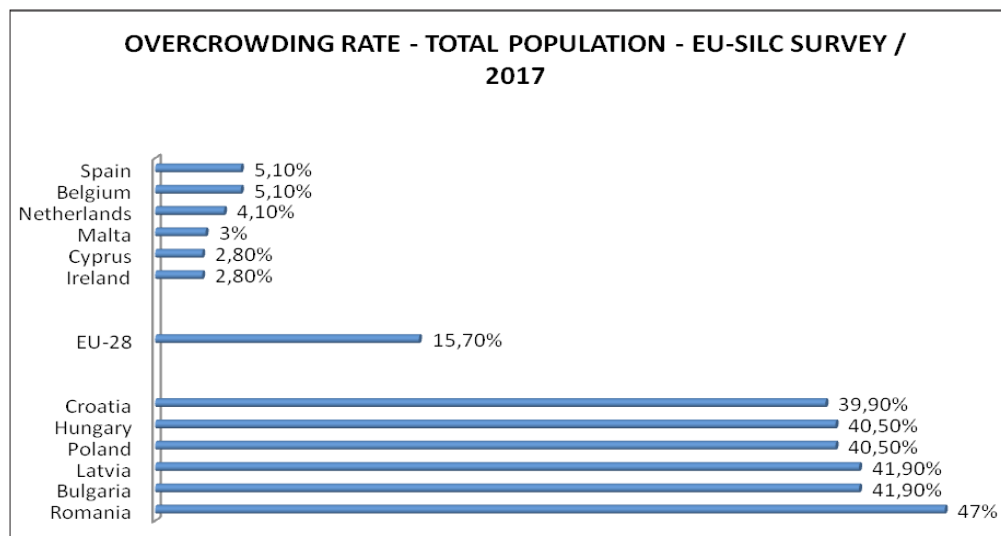
Source: Ec.europa.eu (2017b)

c) In 2017, approximately 15.7% of the EU-28 population lived in overcrowded housing

A person is considered as living in an overcrowded household if the household does not have at its disposal a minimum number of rooms equal to the sum of:

- One room for the household;
- One room per couple in the household;
- One room per single person aged 18 and more;
- One room per pair of single people of the same gender between 12 and 17 years of age;
- One room per single person between 12 and 17 years of age and not included in the previous category;
- One room per pair of children under 12 years of age).
 - **In Romania about 47% of the population lived in overcrowded housing in 2017;** (Bulgaria – 41.9%, Latvia – 41.9%, Poland – 40.5%, Hungary – 40.5%, Croatia – 39.9%);
 - To the other pole were Ireland and Cyprus, with an overcrowding rate of only 2.8% (Malta – 3%, Holland – 4.1%, Belgium – 5.1%, Spain – 5.1%);

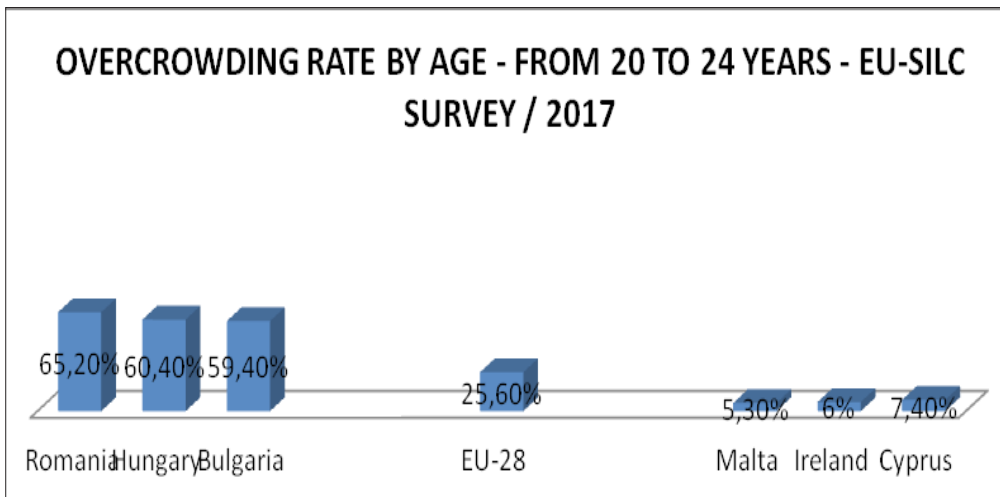
Figure 4. Overcrowding rate – Total population



Source: Ec.europa.eu (2017c)

- **At the EU-28 level people aged 20-24 years had the highest overcrowding rate in 2017 – 25.6%;**
 - **Romania took first place in this age group, 65.2% of people aged between 20-24 years lived in 2017 in overcrowded housing** (Hungary – 60.49%, Bulgaria – 59.40%);
 - To the other pole was Malta for which only a population of 5.3% of this age segment lived in 2017 in overcrowded dwellings (Ireland – 6%, Cyprus – 7.4%);

Figure 5. Overcrowding rate by age- from 20 to 24 years



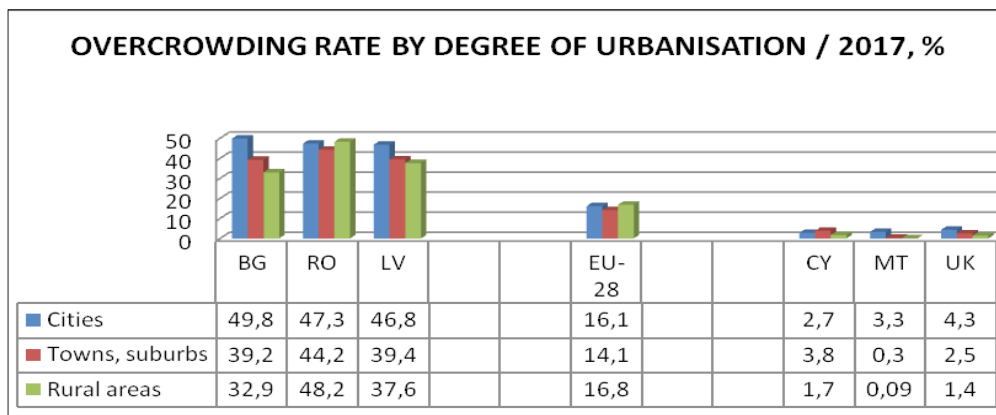
Source: *Ec.europa.eu (2017d)*

- **People aged 16-19 years were in 2017 the most exposed to overcrowding in Romania – 71.2%** (Bulgaria – 66.4%, Hungary – 64.2%);
- Very high scores were recorded in Romania in 2017 and for the people aged 15-25 (68.9%) and those aged between 16-24 years (68.3%).
- **At EU-28 level people aged 65 years and above recorded the lowest overcrowding rate in 2017 – 6.2% (in Romania – 18.7%);**
- **At the EU-28 level female people are generally more exposed to overcrowding than male;**
 - The most exposed female persons were in 2017 aged between 12-17 years – 25.6% (for male persons there was a 25% overcrowding rate);
 - **In Romania in 2017 74.3% of female aged 12-17 years lived in overcrowded conditions;** equally high levels of overcrowding rate

were also recorded for female aged between 15-19 years (72.8%) and 16-19 years (71.4%).

- The rate of overcrowding varies greatly in the EU-28 in terms of urbanisation. Thus, in 2017 it lived in overcrowded conditions approximately **16.1% of the population of large cities, 14.2% of the population of suburbs and small towns and 16.8% of the population of the rural area**;
 - **The overcrowding rate was approximately 7-10 percent higher in the urban environment than in the rural environment** in Denmark (14.8%/4.7%), Czech Republic (20.1%/10.7%), Sweden (18.8%/8.4%) and Italy (31.4%/24.4%);
 - There were exceptions from the pattern described above (the overcrowded rate was much higher in small towns and suburbs than in major cities) – Slovakia (42.5%/34.3%) and Spain (5.6%/5.3%);
 - The largest overcrowding rate in the urban area was registered in Bulgaria – 49.8% (at the opposite pole the lowest values of the overcrowding rate were recorded in Cyprus – 2.7%, Malta – 3.3% and UK – 4.3%);
 - **In the urban environment Romania recorded in 2017 an overcrowding rate of 47.3 %**; in suburbs as well as in small towns approximately 44.2% of the population of these areas lived in 2017 in overcrowded conditions;
 - For Romania the situation is not better in rural areas where almost half of this population lives in overcrowded conditions (48.2%);

Figure 6. Overcrowding rate by degree of urbanisation

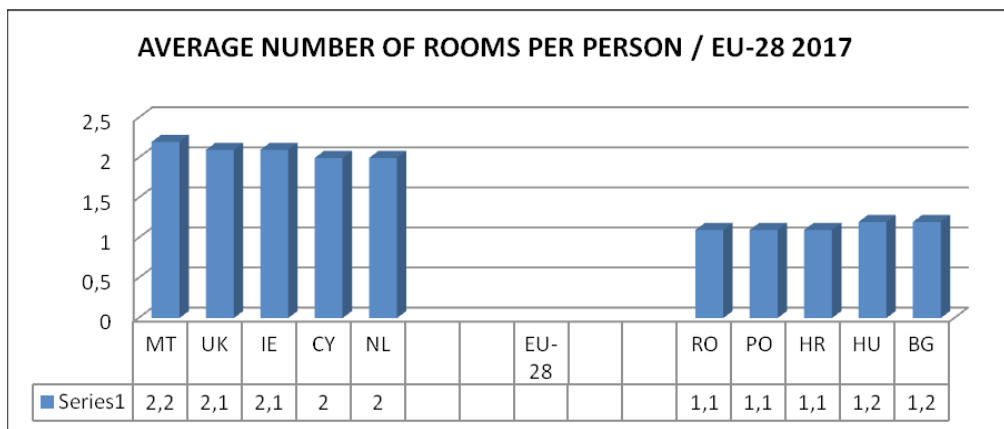


Source: Ec.europa.eu (2017e)

d) On average a person who was living in 2017 in the EU-28 was owning about 1.6 rooms

- There are still discrepancy between the EU-28 states:
 - Progress in some countries is up to 0.9-1.1 points for countries like Malta – 2.2, UK – 2.1, Ireland – 2.1, Cyprus – 2, the Netherlands – 2, while for the former communist states the situation remains unchanged: Romania – 1.1, Poland – 1.1, Croatia – 1.1, Bulgaria – 1.2, Hungary 1.2;

Figure 7. Average number of rooms per person

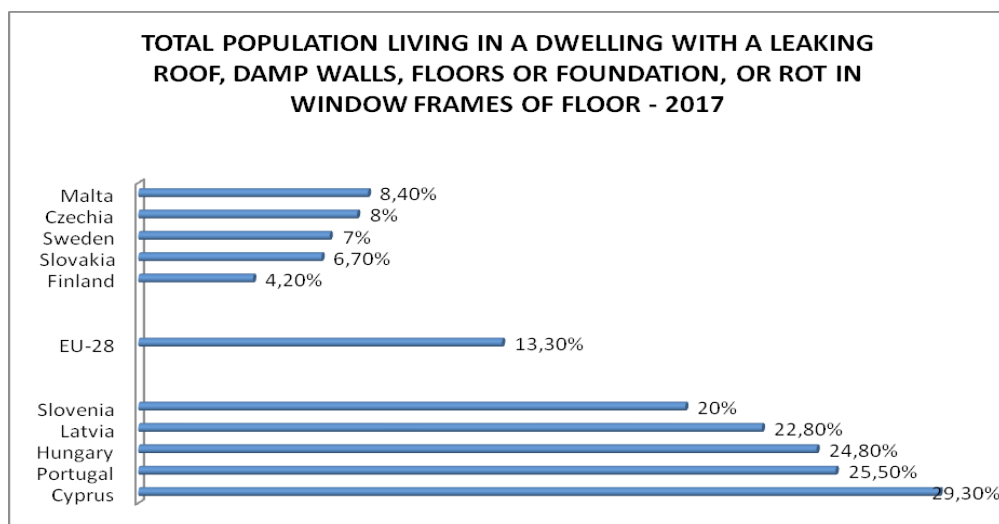


Source: Ec.europa.eu (2017f)

- **Generally the number of rooms/person is larger in rural areas than in the urban areas** (in major cities positive deviations from the European average were recorded especially in Malta (+ 0.6), Cyprus (+ 0.5) and Belgium (+ 0.4);
- In 2017 in the EU-28 the average number of rooms per person was higher for owners (1.7 rooms/person) than for tenants (1.5 rooms/person);
- **In Romania, in 2017 the average number of rooms per person was higher for owners of houses (1.1 rooms/person) than for tenants (0.8 rooms/person);**

e) Approximately 13.3% of people who have lived in 2017 in the EU-28 area had infrastructure problems at home (roofs, walls, floors, windows, etc.)

Figure 8. Total population living in a dwelling with a leaking roof, damp walls, floors or foundation or rot in window frames of floor



Source: Ec.europa.eu (2017g)

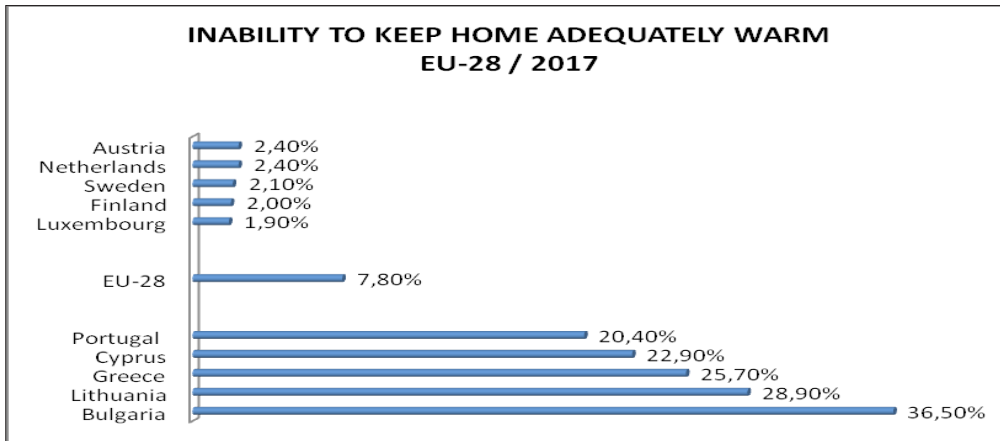
- The population most affected was those under the age of 18 (14.7%),
- Also households with three or more adults with dependent children (15.7%);
- In Cyprus, about three out of ten people have had in 2017 large problems for the maintenance of the infrastructure of the houses in which they live (29.30%);
- Similar problems were recorded in Portugal (25.5%), Hungary (24.8%), Latvia (22.8%) and Slovenia (20%);
- At the opposite pole was Finland (4.2%), Slovakia (6.7%), Sweden (7%), Czech Republic (8%) and Malta (8.4%) with values far below of the European average;
- **Romania was in 2017 below the European average, about one Romanian in ten was registered with problems related to the infrastructure of the houses in which they live (11.1%).**

f) Approximately 7.8% of the EU-28 population was incapable to keep their home adequately warm in 2017

- The highest values were recorded in Bulgaria (36.5%), Lithuania (28.9%), Greece (25.7%), Cyprus (22.9%) and Portugal (20.4%), where the average European value was exceeded by a percentage between 13%-29%;

- **In 2017 in Romania approximately 11.3% of the population was incapable to keep their home adequately warm;**
- At the opposite pole were states such as Luxembourg (1.9%), Finland (2%), Sweden (2.1%), Holland (2.4%) and Austria (2.4%) with values far below the European average.

Figure 9. Inability to keep home adequately warm



Source: *Ec.europa.eu (2017h)*

- **18.4% of the poor population of the EU-28 (with income in the area of poverty threshold) could not ensure in 2017 the warm suitable for the dwelling;**
 - In some states, the situation was more than alarming for the population in extreme poverty, about half of them had huge difficulties in ensuring the warm during the winter: Bulgaria – 59.5%, Cyprus – 46.8%, Greece – 45.3%;
 - In the other pole were states such as Luxembourg (1.9%), Finland (2%), Sweden (2.1%), Holland (2.4%) and Austria (2.4%) with a small percentage from the poverty population who had difficulties in ensuring the warm during the winter;
 - **In Romania, approximately 17.4% of the poor population had in 2017 difficulties in ensuring normal warm conditions during the winter.**

1.2. Living environments

Complementary, housing conditions are affected of the quality of the residential housing environment. Noise, pollution, crime, violence and vandalism are all

so many factors that influence the living conditions. For the year 2017 Eurostat data showed that:

- For around 17.5% of the EU-28 population **the noise was one of the most serious environmental problems**;
 - Highest values (over 20%) were registered in Germany (26.1%), the Netherlands (25.6%), Malta (24.9%), Portugal (23.5%), Luxembourg (21.6%) and Greece (20.1%);
 - **In Romania, approximately 19.3% of the population complained in 2017 that a serious environmental problem who affecting the quality of residence is noise pollution.**
- For approximately 14.1% of the EU-28 population pollution and misery (the presence of rubbish) have been catalogued as some of the worst environmental problems;
 - Highest values (over 20%) were registered in Malta (26.5%), Germany (24.6%), and Greece (20.3%);
 - **In Romania, about 14.6% of the population complained in 2017 that a serious environmental problem who affecting the quality of residence is pollution and misery.**
- For about 12% of the EU-28 population crime, violence and vandalism were catalogued some of the most serious environmental problems who affecting the quality of the dwelling;
 - Highest values (over 20%) were registered in Bulgaria (23.6%), Germany (24.6%), and Greece (20.3%);
 - **In Romania, about 11.3% of the population complained in 2017 that a serious environmental problem who affecting the quality of the dwelling is crime, violence and vandalism.**

1.3. Housing affordability

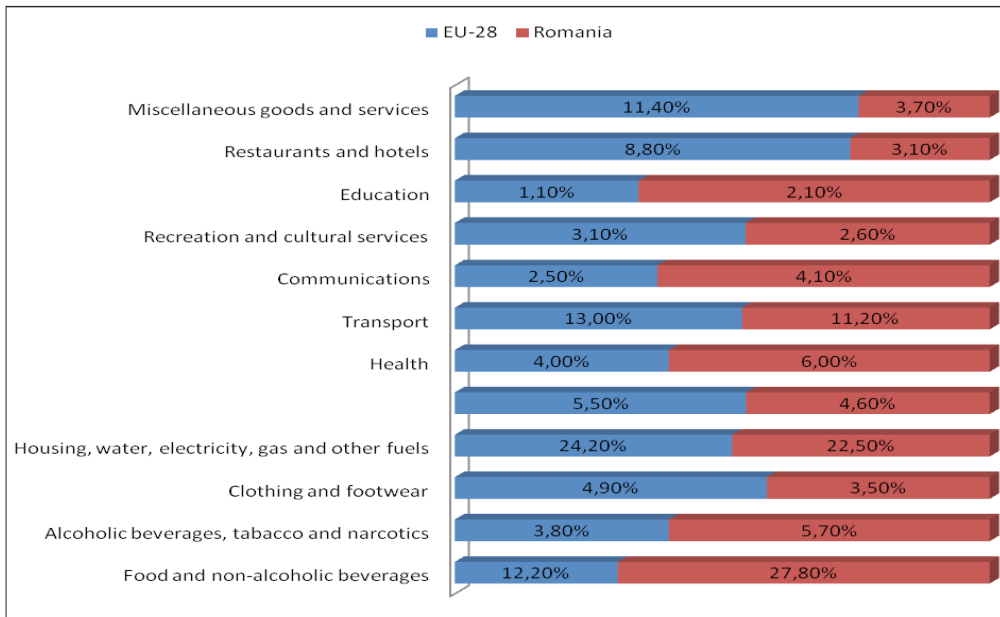
In many cases housing costs are the most important component of monthly expenditure for households, affecting some of the expenses for certain basic needs (which are often cancelled or postponed). For the year 2017 Eurostat data showed that:

- Approximately 10.4% of the EU-28 population have spend at least 40% of the household income for housing (the highest value was in Greece - 39.6%);
- Relatively high values above the European average were also recorded in Bulgaria (18.9%), Denmark (15.7%), Germany (14.5%) and **Romania (12.3%)**;

- At the opposite pole were Malta (1.4%), Cyprus (2.8%), Ireland (4.5%), France (4.7%) and Estonia (4.8%) with values located far below the European average;
- The situation was very complicated for poor population, **approximately 37.9% of this population have spend in 2017 at least 40% of household income for housing**;
 - The most serious situation was recorded in Greece where 89.7% of this population have spend in 2017 at least 40% of income household for housing;
 - In Romania approximately 36.3% of the poor population have spend in 2017 at least 40% of household income for housing.

The consumption of goods and services in households differs from one country to another. The information can be analysed according to the classification of individual consumption for purposes (COICOP), where division 04 covers dwellings, water, electricity, gas and other fuels. Figure 10 is relevant to compare the behaviour of the Romanian consumer to that of the European in general.

Figure 10. Final consumption expenditure of households by consumption purpose



Source: Ec.europa.eu (2017i)

Conclusions

- In 2017, 28.9% of Romania's population lived in urban areas, 46.5% in rural area and 24.6% in towns and suburbs;
- Romania is found in the current European trend, 65.9% of the population lived in 2017 in houses, while 34.1% in flats;
- Romania is the country with the most housing owners - 96.8%;
- However, approximately 47% of the Romanian population lived in 2017 in overcrowded dwellings;
- In Romania, generally the number of rooms/person is larger in rural areas than in the urban areas;
- The average number of rooms per person was in 2017 in Romania higher for owners of houses (1.1 rooms/person) than for tenants (0.8 rooms/person);
- In Romania approximately a Romanian in ten was registered in 2017 with problems related to the maintenance of the infrastructure of the houses in which they live (11.1%);
- In 2017 approximately 11.3% of the Romanian population was incapable of ensuring the warm of the home in winter;
- About 19.3% of the Romanian population complained in 2017 that a serious environmental problem who affected the housing quality was the noise pollution;
- In Romania, about 14.6% of the population complained in 2017 that a serious environmental problem who affected the housing quality was the pollution and misery;
- In Romania, about 11.3% of the population complained in 2017 that a serious environmental problem who affected the housing quality was the crime, the violence and the vandalism;
- Approximately 12,3% of the Romanian population have spend in 2017 at least 40% of household income for housing.

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STRUCTURAL CHANGES IN THE ROMANIAN LABOUR MARKET

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Abstract: *Analysis of the effect on the evolution of the labor market predicts a significant increase of demand in skills and qualifications on all levels of workplaces in the future. Industrial and technological changes bring along higher demands of medium-to-highly qualified personnel, while leaving behind the underprepared. Workplaces that required a low level of preparation in the past have also shown a constant increase in medium or even high-level skill requirements. Currently, the level of skill demand is increasing in all professional categories, including even the lowest tiers of occupations. There is a noticeable increase in demand for a highly qualified and adaptive workforce, as well as workplaces requiring high qualifications and formal education. Requirements regarding skills and qualifications also suffer a significant increase in all workplace levels. Structural changes in the labor market lead to a polarizing increase of workplaces dedicated to the highly-qualified, resulting in a drop of demand for workplaces involving trivial tasks, suited for the less qualified personnel. Thus, workplace polarization occurs on all professional levels creating a significant imbalance in favor of the highly-qualified. In this context, less qualified personnel (or non-qualified) will face multiple adversities when searching for a workplace in the future as well as confronting the permanent threat of unemployment (statistics indicating that non-qualified or less qualified personnel have approximatively twice the unemployment rate when comparing them to the highly-qualified category). In the same context, Romania's economy is also in a constant and dynamic change process, generated both by the transition to a market-based economy and by the effects of globalization. To further understand the labor market mechanisms, this paper analyses a series of statistical indicators obtained*

either through direct measurement such as: labor resources, active population, working population, number of employees, number of unemployed, either through calculation of derived indicators such as: activity rate, employment rate, unemployment rate, etc.

Keywords: *labour market, employment, segmentation, unemployment*

JEL Classification: *E24, J21, J60*

1. Introduction

The new wave of technological advances will change the current work profile requirements (European Commission, 2010a). Some employees will either requalify for the existing industries, or change their activity domain completely. Robotics, artificial intelligence, virtual reality, infographics, etc. can generate new, more performant and better paying workplaces, but it's the companies' and the schools' obligation to provide cyber-physical-human systems that can bring satisfying results to employees and young adults. Technological evolution, scientific research and the digital revolution that take place today demand implementation of methods to "catch up with the train" of such fast changes.

Regardless of age and gender, the ability to be versatile to change must be permanently kept at maximum level (European Commission, 2010b). The actual issue is not the sudden lack of workplaces, but the sudden increase of unfilled workplaces due to lack of required skills.

The workplaces that will never disappear will be the creative ones. "Creative" does not only refer to arts or advertising. It can also mean what a man can do more, compared to a "machine". To be creative in one's workplace or business means to create authentic and sellable services and goods. It means adding extra value compared to what can a machine offer, even if said machine has artificial intelligence, or compared to a competitor from the same market or workplace (European Commission, 2014).

"Safe" workplaces, in which one can "retire" after doing the same thing for over 40 years will no longer exist. The moment an economy branch, company, or workplace suffers transformation is the moment when every single employee must either adapt to change and requalify for a new workplace, or begin a new activity or business.

Those who will find a new workplace or start a business the easiest will be those who have the most complex set of skills and knowledge, from a wide variety of domains. Interdisciplinarity will be mandatory in the most advanced domains, such as: biotechnology, nanotechnology, biochemistry, etc. but also

in the most common workplaces, which will require IT knowledge, knowing a foreign language or marketing.

Schools and companies are not the only agents that should collaborate closely to provide specific skill preparations required in today's labor market. Young adults must also collaborate and understand the future economy challenges while cultivating their own required skillsets.

All these aspects will bring a certain structural change in the labor market on all economies.

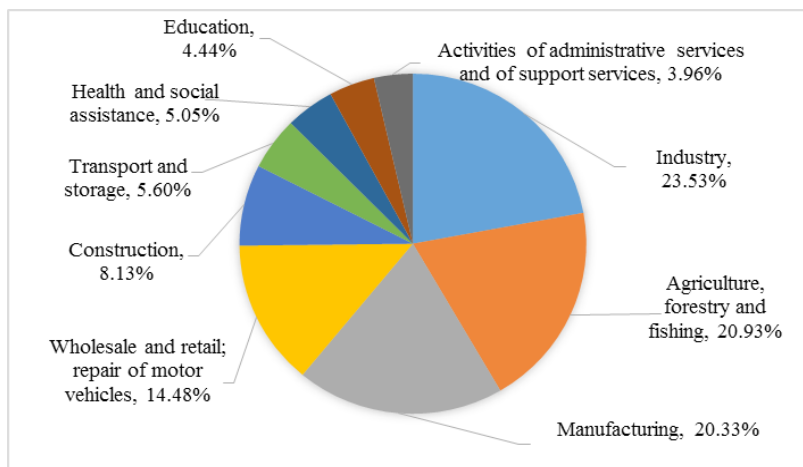
2. Romanian labor market short characterization

As of 1st of July 2018, out of 19.472 million Romanian residents, only 8.696 million people belonged to the civilian active population, since it dropped down by 454 thousand people in 2018 compared to 2008.

In terms of gross activity rate, there has been an increase during the years 2008-2016, by 2.2 percentage points (from 42.6% in 2008 to 44.8% in 2018). However, in 2018, it has dropped by 0.1 percentage points compared to the gross activity rate of 2014.

The number of employees of the civilian active population by categories of activities of the national economy (Figure 1) has dropped, starting from year 2012, in Agriculture, Forestry and Fishing (by 3.88 percentage points in 2018 compared to 2012).

Figure 1. Civil economically active population by some categories of activities of the national economy, 2018



Data source: TEMPO-online database, 2017

Between 2007-2011, the active population has dropped in all the national economy's sectors, except: "Administrative and Support Service Activities", which registered an ascending trend during the entire period of analysis, "Information and Communication", "Hotels and Restaurants", "Transportation and Storage" and "Wholesale and Retail: Repair of Motor Vehicles and Motorcycles". The year 2016 is the first year when the weight of the manufacturing workforce population surpasses agriculture (TEMPO-online database, 2017).

The labor resources registered in 2018 have dropped by 1.58 percentage points compared to 2017. By 2010, at national level, labor force resources were reduced by 978 thousand people, compared to 1990. Starting with 2010, labor force resources decreased annually, until 2016, when there was a slight increase, followed by a descending trend.

During the period 2008-2018, the employment rate had a fluctuating evolution, but from 2014 it started to increase slightly, reaching in 2018 at 64.8%. Similar to previous years, the employment rate was higher in men in 2018 (73.52%, compared to 56.2% in women). From a residence point of view, the employment rate was higher in the urban area (65.8%, compared to 63.5% in the rural area).

The highest level of employment rate for the elderly was registered among the graduates of higher education (87.2%). 66.2% of the people with a medium level of education and only 42.0% of those with a low level of education were employed.

Employees, increasing in 2018 compared to the previous year (+112.35 thousand people), still held the highest share (74.8%) in the total working population. In 2018, self-employed and unpaid family workers represented 24.16% of the working population (The Romania Statistical Yearbook, 2008-2017).

Skilled Agriculture, Forestry and Fishery workers accounted for 18.22% of the total employed population. Significant weights in the total working population also had skilled workers (16.75%), specialists in various fields of activity (15.37%) and workers in the services field (15.09%).

Of the total employed personnel, 20.9% worked in the agriculture sector and 31.25% in manufacturing. In the non-agricultural activities, 6497 thousand people were employed, significant shares among them being held by those who worked in Manufacturing (20.3%), Commerce (14.5%) and Construction (8.12%). Compared to 2017, in 2018, the number of people who worked in Mining and Quarrying (-18.8 thousand people), Construction (-7.6 thousand people), Wholesale and Retail, Repair of motor vehicles and motorcycles (-7.1

thousand people) has decreased. The most significant increases compared to the previous year were registered in Agriculture, Forestry and Fishing (+17.8 thousand people), Professional, Scientific and Technical activities (+13.2 thousand people), Hotels and Restaurants (+11.3 thousand people), Information and Communication (+4 thousand people) and Public Administration and Defense (+2.5 thousand people).

In 2018, the average effective working week for main activities was 38.7 hours per week; 131 thousand people also performed secondary activities, working on average 12.8 hours per week.

The economic advance of 2018 was accompanied by the increase in the number of employees: 5.7 million employees were registered at the end of the year, which is 2.47% more than in 2017. After 10 years since the economic crisis, the labour market in Romania has barely managed to recover lost workplaces, starting with 2018, the number of employees being slightly higher than in 2008. According to the data provided by the National Institute of Statistics, the number of unemployed in Romania decreased by 69653 people in 2018 compared to 2017, and the unemployment rate by 0.8 percentage points.

With an unemployment rate of 4.3% in 2018 (down from the previous year: 5.1% in 2017), Romania occupies a favorable position among the states of the European Union, ranking sixth place in the list of the states with the lowest unemployment rates, a better position in terms of unemployment than countries such as France, Poland or even the Netherlands.

By sex, the difference between the two unemployment rates was 1.2 percentage points (4.86% for men versus 3.6% for women), and in terms of residences of 1.2 percentage points (5.0% in rural versus 3.8% in urban). In 2018, the unemployment rate also had the highest level (16.2%) among young people (15-24 years).

Unemployment has affected the graduates of low and medium education to a greater extent, for which the unemployment rate was 5.8% and 4.3% respectively. The unemployment rate was only 2.1% for people with higher education. The rate of long-term unemployment (in unemployment of one year and over) was 1.8%, and the incidence of long-term unemployment (the share of unemployed persons for one year and over in total unemployment) was 44.1%.

For young people (age 15-24), the long-term unemployment rate (in unemployment for six months and over) was 9.3%, and the incidence of long-term unemployment among youth was 57.2%.

According to a study made by The Employment Workforce Perspective (Manpower Employment Outlook Survey Q1, 2016), there are two industries that could do the most employment, namely: the Trade and Manufacturing sectors. The development of the trade sector is strongly influenced by the increase of consumption at national level. The fact that a similar evolution is expected also in the manufacturing industry is a good sign, but the profile of the companies that will make such jobs should be noted. Thus, one has to take into account the fact that, for example, the automotive sector and those companies that make assembly, they execute operations that in the production chain are considered as basic and implicitly have a low added value, which limits the positive impact on the economy. Even if the increase in the number of employees is socially beneficial, these two sectors often employ unskilled labor and the wages are at the minimum wage in the economy.

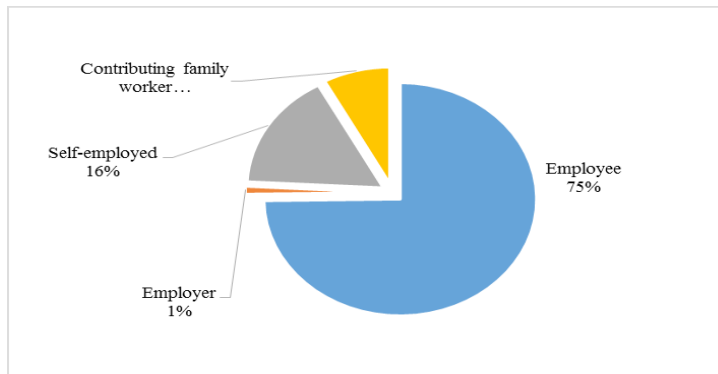
As in previous years, the incidence of atypical work (fixed-term and/or part-time contracts, self-employed work from an economic point of view) continued its upward trend (Eurostat statistics, 2015).

Official statistics indicate an unusually low number of employees with fixed-term and/or part-time employment contracts in Romania, but a detailed analysis shows that the difference between the number of active employees and the number of individual active contracts has increased between December 2017 - December 2018 from 14.3% of the total number of contracts to 14.9%. Therefore, at the end of 2018, the approximately 5.07 million active employees registered by the Labor Inspection corresponded to about 5.88 million contracts. The difference can only be explained by the high incidence of atypical employment contracts.

Regarding the newly created jobs, according to the estimates made by Guga et al. (2019), over 25% of the concluded individual employment contracts were part-time, with an equivalent share having also the fixed-term contracts. In the study published by Trif et al. (2016) there is a highlight on the relatively high incidence of fixed-term employment contracts in sectors such as the construction of the auto industry.

In addition to the atypical work with a contract of employment, the self-employed work continues to weigh heavily on the Romanian labor market. Thus, according to the statistical data of the National Institute of Statistics, in 2018, employees represented only 74.7% of the employed population, 16.25% of the employees having the status of self-employed workers, Figure 2 (TEMPO-online database, 2017).

Figure 2. Structure of the employed population, according to professional status, 2018



Data source: TEMPO-online database, 2017

It is important to note that this structure of employment is not entirely due to high incidence of self-employment in agriculture, as it is also found in non-agricultural sectors. It is natural to consider that a good part of these self-employed workers are in fact self-employed workers, not so strictly from a fiscal point of view, as the Romanian legislation does at present, but, more generally, from the economic point of view. Self-employed workers are less well paid, more vulnerable to job security and weaker to abuse protection than employees are, while having far fewer means to defend their interests (Guga, 2016). These vulnerabilities are also important for employees, since, as in the case of those who work with fixed-term or part-time employment contracts, the precariousness of self-employed work is an indirect source of vulnerability for all participants in the labor market, especially through the pressure it exerts on the wages and working conditions of the employees hired through indefinite-term contracts.

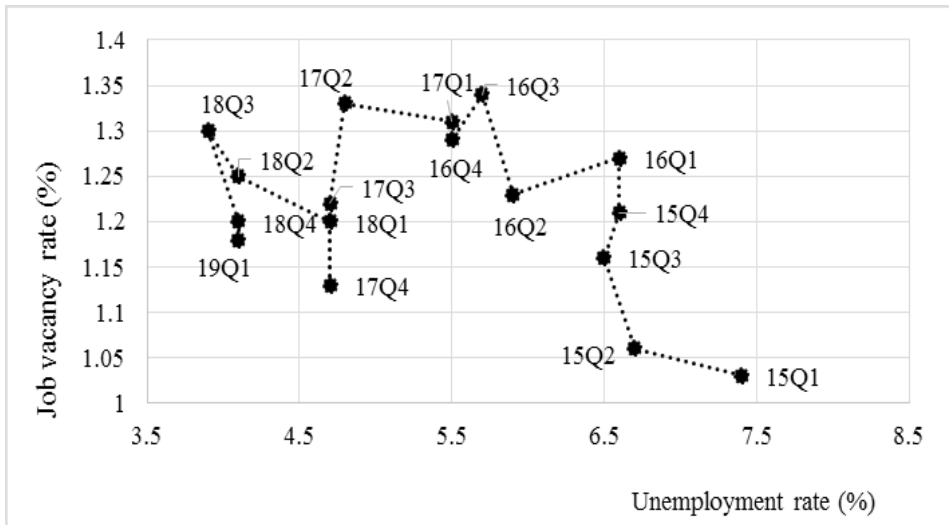
If at the end of 2015 the workforce deficit issue was rarely mentioned on the working agendas of the empowered organizations of their respective domains, at the beginning of 2017 it became, along with the minimum wage issue, the main topic in the debates on the labor market in Romania (National Strategy for Sustainable Development of Romania Horizons 2013-2020-2030; National Strategy for Employment 2014-2020).

Employers, especially in particular, are more and more concerned about the low availability of workforce, especially when it comes to future investments. The problem must be analyzed both from a quantitative point of view (the effective reduction of workforce supply) and from a qualitative point of view (the so-called “skills shortage”, the gap between the qualifications required by the employers and those actually owned by those who are looking for a job).

If, starting with 2012, there was an increase in the vacancy rate (or demand in the labor market), in 2018, however, the level was much lower than the period before the crisis (1.24% in 2018, compared to 1.94% in 2008).

The fact that unemployment has not decreased at an equally rapid pace during the same period is not necessarily surprising, especially if one considers the proliferation of fixed-term contracts, part-time and temporary work (Figure 3).

Figure 3. Beveridge curve for Romania, 1st trimester/2015-1st trimester/2019



Data source: TEMPO-online database (2017), author's work

In 2018, however, there is a decrease in unemployment, coupled with the slight increase in the vacancy rate.

3. Conclusion

What is typical for the national labor market is the fact that, in 2018, labor resources registered a slight reduction compared to 2015, and the employment rate had a fluctuating evolution, but from 2013 it started to increase slightly, reaching at 64.8% in 2018.

In 2016, the highest level of employment rate for the elderly was among the graduates of higher education (87.2%). 66.2% of the people with a medium level of education and only 41.0% of those with a low level of education were employed.

With an unemployment rate of 4.3% in 2018 (down from the previous year: 5.1% in 2017), Romania occupies a favorable position among the states

of the European Union, ranking sixth in the list to the states with the lowest unemployment rates, a better position in terms of unemployment than countries such as France, Poland or even the Netherlands.

In addition to the atypical work with an employment contract, the self-employed work continues to weigh heavily on the Romanian labor market.

By sex, the difference between the two unemployed rates was 1.2 percentage points (4.86% for men compared to 3.6% for women) and by residence area, 1.2 percentage points (5.0% in the rural versus 3.8% in urban).

The fact that unemployment has not decreased at an equally rapid pace during the same period is not necessarily surprising, especially if we consider the proliferation of fixed-term contracts, part-time and temporary work. In 2018, however, there is a decrease in unemployment, coupled with the slight increase in the vacancy rate. From both points of view, however, the labor market in Romania still seems to be far from the situation in 2008.

The depletion of the labor force pool with adequate qualifications, if possible to discuss such topics would be due to the combination between the increase in demand (following the investments) and the decrease in supply (due to the aging and migration of the skilled workers).

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CONTRIBUTIONS TO MODELING THE BEHAVIOR OF CHAOTIC SYSTEMS WITH APPLICABILITY IN ECONOMIC SYSTEMS

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Abstract: *The surrounding reality can be viewed as the result of the interaction of dynamic systems nonlinear complexes. It has been shown, however, that some very simple systems can have it complicated and seemingly random behaviors. The chaos theory aims to explain and to predict in a short time the seemingly random and unpredictable behavior of the systems Nonlinear. Although the ideas preceding the emergence of chaos theory had been around for a long time, they were crystallized for the first by Lorenz (1963) in the work Deterministic Nonperiodic Flow. Lorenz created a mathematical model of the circulation of atmospheric currents of convection and observed that when there is a slight difference between the initial conditions, completely different results are obtained thus rediscovering the phenomenon of sensitivity to the variation of the initial conditions. The phenomenon observed has become a very popular paradigm of chaos theory called the „butterfly effect” and states that if the flapping of the wings of a butterfly changes the weather conditions in the jungle in a minor way Amazonian, this fact can have the effect, at the end of a complex causal chain, of the appearance of a tornadoes in Texas.*

Keywords: *chaos theory, nonlinear dynamics, nonlinear time series analysis, chaos identification, Lyapunov exponent, neural networks prediction of chaotic time series, multilayer, neural networks of support vectors, ARIMA model*

JEL Classification: C23, C26, C38, C55, C81, C87

Introduction

The „butterfly effect” paradigm captures the essence of the chaos phenomena: in firstly the sensitivity to the initial conditions and secondly the deterministic character of them by highlighting structures in the phase space, structures called chaotic attractors. A system whose behavior was considered until recently random becomes predictable short term. The quality of the prediction decreases as the dynamics of a chaotic system evolve time due to the divergence of the initial trajectories. To predict the future behavior of one system, the current state of the system must be known with infinite precision – otherwise impossible in reality.

Objectives

The main objective of the article is to develop models that simulate as accurately as possible the behavior of the systems that generated the analyzed time series, namely that of the variation in the spot price of the electricity consumed in Romania. In the studied time series the presence of some indications of existence was highlighted chaos. The identification of chaos was made possible by the determination of some values whose values suggests the existence of such small-scale chaotic actors. In order to reach this objective, we started from the analysis of the current stage in modeling chaotic systems, the necessary steps have been taken to identify the chaos in the time series through the application of nonlinear analysis methods and finally the actual modeling was made using of two techniques: hybrid modeling ARIMA-time neural network and multilayer perceptron modeling with Echo State Network.

Until the foundation of the chaos theory, the complicated and inexplicable and unpredictable evolution of a system was considered random behavior. With the advent of chaos theory and a its instruments, a new world became visible, and things could be explained from a another perspective. The main advantage of chaos theory is that it allows prediction short-term evolution of chaotic systems and provides explanations of the type of behavior respectively dynamic.

Research

The research is structured in six stages, starting with stage 1 in which it is presented at sea the main concepts related to chaos theory in nonlinear systems.

Some patterns are presented which is repeated in the case of chaotic systems due to the chaos production mechanism itself - the phenomenon of doubling the period. Feigenbaum's number allows predictions to be made regarding the moment when there will be a qualitative change in the dynamic evolution of the system as a result of a fork. Also here is briefly one of the most important notions of chaos theory, a notion that derives directly from the property of systems chaotic to be sensitive to the variation of the initial values, namely the exponent Lyapunov.

In stage 2, titled *The Current Stage in Chaotic Systems Modeling*, they are presented the main tools for modeling the evolution of these systems, and in the end a comparative analysis of them. There are various examples from the literature that describe modeling the logistic function using fuzzy logic, modeling using networks neurons of a test data set, use of Markov chains in statistical modeling of Henon attractor.

Stage 3 describes the classical techniques for modeling and predicting time series. Are presented, with illustrative examples, simple regression, sliding mean method, method Holt, Winter method and finally ARIMA modeling applicable to linear systems. Stage 4 attempts to synthesize the entire process of nonlinear modeling of the series time, according to a procedure presented schematically at the beginning of the chapter and elaborated on the basis consulting the specialized literature. The main methods of identification are presented at large visual manifestation of chaos in time series, methods and sizes that allow identification numerical of the chaotic dynamics, as well as the main theorem on which the systems study is based chaotic. The reconstruction of the phase space is based on Takens' theorem and allows the reconstruction the dynamics of the initial system without knowing anything about the initial system, available only a univariate time series. The purpose of the phase space reconstruction is to characterize the behavior of a dynamic system that manifests itself through an unknown process and highlighting the existence of an attractor with a fractal dimension. The results obtained are presented following nonlinear analysis in case of three time series chosen by the author. Stage 5 presents various methods for predicting time series from the theory perspective chaos. The prediction is made using the support vector neural networks Machines and multilayer perceptron. A time series prediction model is also presented on defining a size on the space of the shapes that represent input data for a neural network time multilayer perceptron. In the last stage, time series modeling is carried out, in which case it could be set in highlights the existence of a chaotic dynamic. Modeling is done by a hybrid method

ARIMA-neural networks and, as a variant that allows a comparative analysis, with the help of a type of neural networks, relatively recent, called networks with echo state (Echo State Network).

Presentation of the main research concepts

Nonlinear analysis of time series

Nonlinear behavior allows a better understanding of complex natural phenomena. Nonlinear dynamics introduced a set of new concepts and tools that allow analysis and analysis investigating the dynamics generated by nonlinear processes. It can be said that at the time of in front, there is a conceptual unification of the notions (attractors, doubling of the period, bifurcations, Lyapunov exponent, sensitivity to initial conditions). Techniques that study the concepts introduced of nonlinear dynamics are grouped under the generic name of nonlinear signal processing or nonlinear analysis.

The behavior of a nonlinear dynamic system is shown in the state space or phase space - a conceptual space in which the dimensions correspond to the variables in the system. Changes over time of the system described by differential equations are reflected by the movements of a point in space condition, movements called trajectories. An image of changing the state of a multi-system time intervals is called the phase portrait. The portraits of the phase reveal the existence of attractors that are regions or points of the phase space to which all the close trajectories converge. A strange attractor will occupy a region of the phase space in which all trajectories will be captured which, apparently randomly they will cover the entire surface of it without repeating. A state space can be created starting from a series of time by graphically representing the observations offset with a certain time interval, a process called state space reconstruction.

Reconstruction of the phase space. Takens' theorem

During the last 20 years various techniques have been developed for signal analysis and processing framed in the category of non-linear chaotic dynamics. These techniques are called generic „Nonlinear signal processing techniques” and is based in particular on the Takens theorem (Takens, 1981). The theorem allows the reconstruction of a one-dimensional or multi-dimensional trajectory equivalent to the initial trajectory extracted from the space of the time series from which it departed. The idea a however, it was used long before its publication. In

1927 Yule (1927) used a graph in $x(t)$, $x(t+1) - x(t-1)$ coordinates for the time series analysis of the sunspots. Inclusion in the phase space is a process by which a series of time is transformed into one series of coordinates in the reconstructed phase space. The set of reconstructed coordinates defines a trajectory in the reconstructed phase space. If the space of the reconstructed phase is m in size, then each reconstructed spatial coordinate X_i is a vector of size m obtained from the series of initial time, taking into account only some components of the original time series separately through a time delay called (Gao, Cao, Tung, and Hu, 2007). In practice, there are two important problems regarding the delay method as a method of phase space reconstruction. The first problem, common to all methods of reconstruction is that of establishing the minimum size of inclusion. This minimum size is unknown and must be determined.

Three methods are used to determine the minimum inclusion size: the method of the false nearest neighbors and that of the saturation of the attractor invariants and the method decomposition into singular values. The method of the false nearest neighbors is based on the general property of the attractor referred to above, namely that the distant points in the original phase space are close in the reconstructed space (false close neighbors), if the inclusion size is incorrectly chosen. The minimum inclusion dimension can also be determined by the saturation method to the attractor invariants (Li, 2006). This technique is based on the fact that once the attractor is deployed completely, its fractal dimension is independent of the inclusion dimension. Through therefore, when the attractor is represented in an incorrect inclusion dimension, its size is dependent on the size of inclusion. To determine the delay, the mutual information method and the function method are used of self-correlation.

ARIMA hybrid modeling - neural networks

The process of determining the ARIMA model consists of two stages:

- Identification - the model that best corresponds to the behavior of the series is determined of time. If the time series is affected by the seasonal component, the model to be determined is called SARIMA (Seasonal ARIMA) and is represented as ARIMA (p, d, q) ($P; D, Q$) S , where d and D ordinally represent seasonal differences and non-seasonal, p and P represent the orders of the seasonal and non-seasonal autoregressive terms, and q and Q ordinally represent the moving average terms. S stands for seasonal difference. The model parameters are determined by studying the graphs according to autocorrelation (ACF) and partial correlation (PACF).

- Verification - consists of evaluating the performance of the model in the description time series behavior. If the performance is not satisfactory it will come back to the previous stage, modifying the structure of the model until the moment when it becomes suitable for capturing the dynamics of the time series. It is considered to consider the initial time series as being composed of a linear component autocorrelated and a nonlinear component, so that the initial time series can be decomposed so:

$$y_t = L_t + N_t$$

Following the modeling of ARIMA, the time series will be formed of the linear component modeled and the residues obtained:

$$y_t = L_t^m + e_t$$

The residues obtained will in fact contain nonlinear relationships that could not be captured by the ARIMA model. The nonlinear component of the time series will be modeled using a network multi-layered perceptron neurons (Gonzales, 2000).

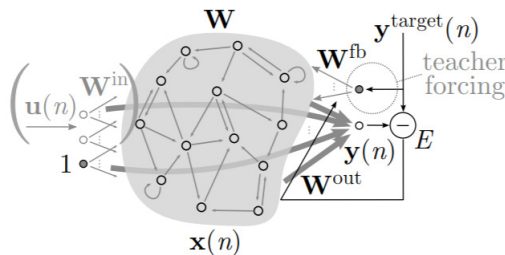
Neural networks Echo state networks

A general problem that arises when training recurrent networks is that, because the weights of the connections between neurons have variable values, the space of solutions is vast and the possibility of reaching a local minimum instead of the global minimum is significant. Networks ESN tends to solve this problem by training the weights of neuronal connections between reservoir and neurons in the output layer. As a result, tanks that contain fewer neurons tend to generalize better in the case of new data to multi-neuron reservoirs, indicating that, as in the case of FNN networks, the phenomenon of over-specialization may occur or memorizing the results (Jaeger, 2001). In the prediction problems it has been shown that recurrent (backward) neural networks have superior performance to neural networks feedforward. Higher predictive performance is due to the ability of the RNN to form more complex temporal patterns by using units delay between exits and the hidden layer. Recurring connections and delays must be used in problems where information is temporally correlated because they play the role of a short-term memories, memory that, given the fact that the above information influences the present state of the network which, in turn, determines the future values from the outputs network, contributes to the improvement of the generalization and thus, to obtain very good results in prediction problems (Donner, 2011). The same connections, however, cause

the complexity of the interaction to increase dynamic between neurons, which will require very complex network training algorithms that partially converge.

ESN and another alternative to the training and use of recurring networks, Liquid State Machine (LSM) laid the foundation for data processing techniques included in the field called Reservoir Computing. ESN represents a new paradigm for the use of recurrent neural networks trained with a much simpler training algorithm than the classical ones. The idea that led to the creation of this type of network is based on the fact that, under certain conditions, the state of the network becomes asymptotically independent of the input values, their influence decreases over time. The basic idea from which he started his research in the field of ESN networks involves generating a recurrent neural network whose input is presented a signal that determines the creation of a wide spectrum of dynamics in the reservoir of neurons that form signals nonlinear output. The linear combination of these and the input signal determines the obtaining a reading function, that is, a prediction of the desired output signal. The main reason for the increasingly frequent use of this type of neural network is is the very simple learning algorithm. The only weights that are updated are those between the dynamic reservoir, figure 1 (hidden layer) and exits, thus avoiding the situation where the trained network reaches a local minimum, thus altering the quality of learning, its results and especially of the generalization being suboptimal (Lukosevicius, 2012). Selective update of weights eliminate the situation where the simultaneous updating of all weights determines the occurrence the chaotic behavior of the network, in which case a slight change in the value of the inputs produces a completely different result at the output of the network. The occurrence of such a phenomenon prevents touching network convergence.

Figure 1. Training with teacher forcing



The results of the research are:

1. Conduct a synthesis in the very broad field of time series analysis and prediction. I have especially focused on nonlinear analysis of time series for identification purposes manifestation of chaos according to a methodology that involves going through some stages succession. For this purpose, we analyzed the time series corresponding to the leueuro exchange rate. Although studies on this type of problem abound and most put it evidence of the existence of a chaotic dynamics, in the case of this time series there are no indications to confirm the hypothesis from which I left.

2. I applied nonlinear analysis methods and techniques over the spot price time series a electricity and time series of daily flows of rivers and I emphasized the existence of a chaotic dynamics. Chaotic dynamics implies the existence of a relationship deterministic causes and guarantees the possibility of short-term prediction of values future.

3. In the research, we made a comparison between two types of neural networks that are falls into the category of global methods for predicting chaotic time series, namely MLP network (Multilayer Perceptron) and SVM network (Support Vector Machines) support vector machines. I focused on these prediction tools because the network MLP is a universal approximator, being able to learn nonlinear relations between inputs to could predict future values. We tested the performance of these two types of networks neurons over a set of three time series: the Mackey-Glass time series, the time series Lorenz and the one corresponding to the daily evolution of the spot price of electricity. Into the following the results analysis it was established that MLP time networks perform better, and performance depends on the number of neural network inputs.

4. I have demonstrated empirically that, in the case of chaotic time series, the number of entries of The MLP neural network, for which optimal predictions are obtained, must be approximate equal to the product between the inclusion size and the delay parameter used for reconstruction of the state space.

5. Developing a neural model that allows the prediction of economic growth or decline given the individual evolution of a set of indicators. Graphic representation of the evolution of activity in an x-y axis system can be obtained as follows: each form represents a point in the plane where x is the time period corresponding to the form, and y is the class to which the form belongs. The accuracy of the representation depends on the number of classes. This representation first implies the ordering of classes and their

corresponding renumbering in the sense from negative evolution to positive evolution and then defining a size that characterizes each class. In the study, I took considering a set of indicators describing the economic performance of Romania in 2000-2016.

6. I determined models of the two time series by applying two modeling methods: hybrid modeling that involves developing a valid ARIMA model and then using a a multilayer perceptron and the second method involving the use of a network type neural network called the Echo State Network. This second time series is in especially difficult to model because it has special features (return to average, atypical values, seasonality, negative prices).

7. I designed a program, written in Matlab, to simulate ESN time networks.

Conclusion

In my opinion, future research that extends those in this research may focus in the following directions:

- Modeling the time series considered in this research using data assimilation with the help of Kalman Unscented filters and Wavelet neural networks;
- Identification of chaos and other time series corresponding to the manifestations of some real-world processes and establishing possible correlations between the onset of chaos and qualitative changes in the evolution of the system;
- Creating a prediction algorithm that uses the combined capabilities of ESN and wavelet neural networks;
- Identification of the optimal order of the neural model used for modeling and prediction of chaotic time series.

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MANAGEMENT CONTROL AND FINANCIAL MANAGEMENT WITHIN ECONOMIC ORGANIZATIONS

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Abstract: *This paper deals with management control as an essential factor in monitoring the functioning of the economic management of economic organizations. Management control is the set of procedures and tools that allow an organization to set goals, guide management decisions and behaviors to achieve goals and ensure that the necessary resources are available and used effectively and efficiently in carrying out activities associated with the goals set. It intervenes in all situations where the working environment is indefinite or unclear. Through the management control it is tracked whether the stages of the managerial process regarding the management of the financial resources and the patrimonial management are properly completed. The management of the economic organizations through the implementation of the management control ensures that it has sufficient data sources and information that guarantees that the managerial decisions made within the different functional structures of the organization are coherent and that, in the short term, they meet the objectives.*

Keywords: *internal audit, management control, costs, management accounting, internal control, managerial performance, budget system, dashboard*

JEL Classification: *M40, M41*

Management control in economic organizations and its role

Management control is the lever for tracking financial management and can be viewed as an organization's pilot system, which intervenes at all hierarchical levels and integrates knowledge from multiple disciplines, such as accounting, financial management, marketing, human resources management, strategy. .

In the economic organizations the management control is exercised to ensure the achievement of the objectives, as well as to help measure the financial performances, determining and analyzing the causes of the occurrence of deviations between the results obtained and the objectives set. When the objectives are not reached the management control intervenes in order to limit the dangers and establish the responsibilities.

To be effective, the management control must be oriented towards aspects that concern the clarity of the objectives, the motivation of the staff, the quality of the communication and the risk management. In achieving its goals, the management control operates with the notions of: cost (conception, motivation, distribution, and outsourcing); quality (indicators, improvement); time (real, discounts); organization (employees, structure).

The place that the management control occupies within the organization depends on its size, the way of stimulating the staff, the degree of decentralization, the working environment and the control environment, as well as the place and importance of the financial function within the organization. The quality of the management control can be appreciated when this activity ensures the performance of the organization.

Management control monitors the effectiveness and efficiency of the resources used in achieving the objectives and examines the coherence of the decisions taken within the different organizational structures. Management control is a communication and information system, which exists within each management function and which, regardless of the nature of the activities, involves defining objectives, measuring results, analyzing deviations and making corrections. Through its objectives, management control ensures the link between the organization's strategy and the operational level. A well-designed management control should cover the entire management process (Cucui, Horga, and Radu, 2003).

The management of the economic organizations uses the management control as an effect of reaction to what the competitive economic-social environment offers (delayed, intermittent, incomplete or imperfect information).

Some of the specialists in the field consider management accounting to be included in the management control, because management accounting integrates both analytical accounting elements, such as cost calculation and control, as well as budget management elements, such as budgeting. And monitoring their execution, which correspond to the field of action of the management control. This support is justified if one considers the fact that, in practice, management accounting aims to establish the relationship between expenses and needs, which establishes the belief that the activity of management accounting is part of management control or, more precisely, an instrument of control management (Iacob, Croitoru, and Calotă, 2011).

However, the present reality requires a redefinition of the relationship between financial accounting and management control, so that accounting information becomes a reliable tool for management control, and management control is designed as a control system less dependent on accounting information.

The need for management control in economic organizations

The management control appeared in response to the needs of the economic organization regarding the economic efficiency and the need to ensure an efficient, increasingly complex management, if we refer to the tendencies of decentralization of responsibilities.

The premises that lead to the need for management control are generally determined by the evolution of the management of the economic organizations and the environment in which they operate. The development of the management control takes place mainly in times of difficulties and in emergency situations, imposed by the economic, technological and political changes, which determine the need to adapt the organization to the external environment.

The management control acts at the level of the organization, on two main directions of responsibility:

a) management control is used by those decision makers who incorporate their judgments and actions in the management control system, adopt action plans to achieve the objectives and measure their performance based on the established indicators;

b) the management control is used by the management within the financial direction, responsible for the economic and financial balances of the organization. It collects, summarizes and presents useful information for exercising management control. The calculations and analyzes performed are subject to the judgments of the operational management.

Management control can be defined as a control system of the economic organization, which intervenes at all levels of decision making and integrates knowledge from different disciplines. A management control system in order to be effective and to become operational must incorporate several elements, respectively:

- a) knowing the situation of the organization at the moment of starting the elaboration of the action plan;
- b) defining the objectives and detailed programming of the activities;
- c) verification of the activities by comparing them with the recorded results;
- d) identification of deviations from the normal evolution of the activities and objectives established;
- e) establishing and taking measures to eliminate errors and correct deviations.

The role of the management control is to help the management to better coordinate its actions, in ensuring the functioning of all the functional structures of the organization, taking into account the internal and external circumstances. It must guarantee that the resources are well used and in accordance with the general interests of the organization.

The objectives that the management control must meet refer to:

- a) drawing up development strategies taking into account the financial constraints of the organization;
- b) implementation of strategic directions from a financial point of view and based on indicators;
- c) measuring the performances by using those indicators and criteria that make possible a correct evaluation of the results;
- d) imposing the observance of certain rules and procedures for the good management of the patrimony;
- e) determining gaps and taking corrective measures following the control of pilotage acts;
- f) assessing and informing about risks and allocating resources according to them;
- g) defining and establishing systems for delegating responsibility and creating conditions for motivating the human factor to ensure the achievement of the established performances.

Management control has to be the instrument of attention and cohesion of the management, providing the necessary elements for management decisions.

Tools used by management control

The management control approach is useful from the point of view of the instruments used, namely: management accounting; the budget system; management dashboards.

Management accounting mainly ensures the recording of operations regarding the collection and distribution of expenses by destinations, respectively by activities, sections, manufacturing phases, cost or profit center, as the case may be, as well as the calculation of the purchase, production, processing cost. Of the goods entered, the works executed, the services provided, the production in progress, the fixed assets in progress.

The analysis of the performance of the organization from the point of view of the management control is conditioned by the knowledge of the objectives of the management accounting, which must ensure the integration of the accounting information in the managerial activity.

Managerial accounting is an important tool in the planning and forecasting of the activity, in the preparation of the production expenses budget, as part of the unit's revenue and expenditure budget. The knowledge of the costs gives the possibility to take measures regarding the modification of the technological processes and in order to reduce the production costs. This type of accounting has become the most important source of information on economic activity, both at the entity level and at the national economy level (Caraiani and Dumitrana, 2010).

Designed as an internal decision-making tool, management accounting is the main provider of information needed to manage and perform management control. In order to fulfill the responsibility of ensuring the maintenance of the organization on the market, the management control must have a complex, operative and accurate information of the operations and the financial flows, as well as an adequate degree of knowledge of the costs.

The cost is appreciated as a basic element in the competitiveness of the production and the stability of the organization, it represents an economic lever for the improvement of the economic management, as well as a criterion for evaluating the economic activity and the material stimulation.

The budgetary system, is a tool of management control, helps in the process of controlling the managerial decisions and in setting the objectives regarding the improvement of the organizational performance, intervenes to regulate the possible deviations.

The budgetary system, consisting of several budgets classified by several criteria and a process of budgetary control, is a specific instrument for management control, communication and coordination, but also a tool that allows the identification of negative effects. It involves conducting activities characterized by complexity and diversity and grouped as follows:

- a) the forecast, which implies the elaboration of the budgetary documents foreseen;
- b) budgeting, which implies the recording of figures resulting from forecasts in the budget;
- c) the budgetary control, whose main objective is to compare the forecasts with the achievements, allows to compare the real situation with the situation provided in the budget.

The budgetary control is carried out by confronting each chapter of the budget with the level of actual achievements.

The dashboard, as a tool of management control, ensures the pursuit of objectives at all hierarchical levels and categories of functions of the organization. It provides information to the management of the organization, allows management decisions and implementation of business plans and allows corrective measures to be taken.

The dashboard represents a set of data and indicators that allow management to know the status and evolution of the systems they manage and helps identify trends from one period to another. It is presented in the form of a document, or as the case may be, a graph that includes indicators of the nature of accounting and financial data (revenues, expenses, and liabilities), physical data (output expressed in physical units), indicators (profitability) and qualitative information (opinions of economic operators on the evolution of the market).

Management control allows the management to ensure that the managerial decisions made within the different functional structures of the organization are coherent and if in the short term it competes in meeting the objectives.

Relationship of management control with other forms of control

Management control cannot and should not be confused with other forms of control, although it is very difficult to clarify the scope and scope of this type of control in relation to internal control and internal audit.

Internal control is the set of policies and procedures designed and implemented by management in order to provide reasonable assurance regarding the achievement of objectives in an efficient and effective manner; compliance

with rules and policies, protection of goods and information, fraud prevention and detection, quality of accounting documents and financial information.

By designing and implementing in practice the internal control system, it aims to decentralize the control activities to the managers of the functional structures of the organization. This implies that each leader, at his level, is responsible for establishing and implementing the internal controls necessary and adequate for the functioning and the performance of the activities he coordinates. Through this organization, management autonomy is conferred for the achievement of the objectives, namely transparency and responsibility in collecting the revenues and efficiency and effectiveness in the use of the managed funds (Vasile and Croitoru, 2011).

Internal control is one of the basic attributes of management and requires a complete check if the activities are carried out in accordance with the established programs, identify the deviations and have the corrective measures to remove them. In other words, it follows the organization and functioning of the organizational system of the organization, the decision making mode, respectively if the objectives set are achieved.

In conclusion, it can be appreciated that, through the internal control system, the operational procedures based on execution rules are examined in principle, while the management control represents the process by which the management ensures that the resources are obtained and used effectively (in relation to objectives) and efficiently (in relation to the means employed).

Internal audit organized as an internal structure, distinct, subordinate to the manager, independent and objective, which has a very wide scope, all the activities of the organization, and represents a form of control designed to evaluate the other forms of control at the organization level.

Internal audit is an independent and objective activity that gives the organization an assurance regarding the degree of control over the operations, a guide to improve its operations and contributes to adding an added value. It helps the organization achieve its goals by evaluating, through a systematic and methodical approach, its risk management, control and governance processes and making proposals to enhance their effectiveness.

The internal audit evaluates the relevance and effectiveness of the internal control, the operations and systems of the organization, it targets the reliability and integrity of the financial and operational information, the efficiency and the efficiency of the operations, the protection of the heritage, as well as the compliance with the laws, regulations and contracts by the organization. Internal

audit is a component of the control system of the organization, which does not carry out control, but performs independent analyzes and evaluations of the processes carried out within it, in order to provide the management with a reasonable opinion on the functionality of the internal control.

In achieving their goals, management control and audit have distinct goals and different purposes, as follows:

- a) the management control ensures an efficient and permanent mobilization of the energies and resources in order to reach the set objectives and provides the elements necessary for the managerial decision making;
- b) the audit ensures the existence and functioning of the internal control system, evaluates the effectiveness of the risk management process and the management processes, and as a result, through the recommendations and conclusions they provide, offers management solutions for improving activities;

From the point of view of their goals and missions, the management control and the other forms of control represent intrinsic components of the management, and from the point of view of the exercise, they represent the autonomous, specific activity, which impose professionalism and fairness, serving both the management of the organization and the and its partners, as well as the state.

Management control and its impact on the performance of economic organizations

In carrying out its tasks, the management control selects the information that will serve as the basis for the evaluation of the organizational performance, monitors the system of established performance indicators, evaluates the organization's performance by analyzing the degree of achievement of the objectives in relation to the planned results.

The management control responds to the needs of the organization, monitors the achievement of the objectives and the organization of the information system (Stere, Ionașcu and Filip, 2006). The implementation of a management control system is the prerequisite for decentralizing the responsibility for carrying out activities and decisions within the organization. Thus, management control compels management to adopt an attitude and make decisions by assessing the effects and substantiating them.

Management control can be applied in all types of structures, but especially in decentralized structures, where it finds its effectiveness, because the decentralized structure consists of a set of autonomous subsystems, with coherent and harmonized objectives. The purpose of management control is to provide useful information for managers' decisions (Ionașcu, 2003).

Management control uses information from financial accounting and provides information for financial accounting assessments and records. The use of financial accounting information in exercising management control should be done with some caution because this information is elaborated taking into account a number of accounting principles (prudence, permanence of methods, historical cost, etc.).

The function of management control must, in principle, be subordinated to the management. Its positioning at another level, limits the scope of application only to some technical execution activities, such as the operations of drawing up the financial statements, the calculation of costs, the elaboration of budgets, etc., to the detriment of the functions of assistance and support in the decision making. The integration of the management control in a hierarchical manner in the organizational chart, risks that it is perceived as an instrument of supervision and sanction. Therefore, management control is recommended to be organized in a functional manner.

Conclusions

The economic organization, regardless of profile and size or the place in which it operates, must permanently evaluate its viability, its ability to compete and adapt, its economic-financial performance.

Management control is a component of the organizational control process and an essential factor of the functioning and evolution of the enterprises. It uses, in the fulfillment of its purpose, specific tools to ensure a planning system, an information system and a procedure for measuring the appropriate performances. The implementation of a coherent management control system ensures the management that the resources are obtained and used effectively and efficiently in achieving the set objectives, informs about the organizational realities and the possibilities to identify and prevent deficiencies and anomalies.

Management control is an information system that collects and processes both past and present information in order to measure the performance of the organization's activities. This becomes useful as the management problems are more numerous and complex.

The management control represents a control of the use of the resources allocated to the different activities and departments of an organization and offers the management an overview on the economic reality, based on the cost-value relation in formulating the concept of efficiency.

The establishment and implementation of management control within economic organizations requires, on the one hand, the existence of a conception and guidelines specific to management control, and on the other hand, the integration of management control practices within an adequate and efficient internal control system at the level organization.

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CONTRIBUTIONS OF THE PROGRAMS OF THE EUROPEAN UNION AND ENTREPRENEURSHIP TO THE DECISIONS REGARDING THE STRUCTURAL CHANGES, THE GROWTH AND COMPETITIVENESS IN ROMANIA

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Abstract: *The economic growth reported annually, from 2012 to the present, is accompanied by the paradox of Romania's fall in most of the global rankings in the reports of the world dedicated to competitiveness, which determines us to appreciate that this growth is not based on supporting elements of sustainable growth at the level of the real economy. The competitiveness of a nation depends directly on the quality of life of its citizens, and on the competitiveness of the company depends the level of performance of the economic-financial indicators and implicitly the welfare of the employees. The loss of positions in the global rankings shows that despite the quantitative advance of the GDP, of the efforts to recover the development gaps, other nations manage to advance faster than us in improving the quality of the investment, administrative, health, education, and living environment day by day. The deficit of foreign trade exceeded 6.7 billion euros in 2018, a deterioration of over two thirds compared to the previous year, and the imbalances continue to deepen in 2019. The deficit of trade in goods and services contributes 71% to the current account deficit the year last. General goods make a negative contribution of over 14.8 billion euros to this deficit, and the surplus of services over 8.1 billion euros partially balances the balance (NBR, 2019). While at European level, the average budget allocated to research and development activities is 2% of GDP, in Romania it is 0.5% of GDP, of which 0.16% is government expenditure, 0.05% sector expenditure of tertiary education and 0.29% private financing (Eurostat 2018). Romania's economy seems to be trapped in middle-income countries, that is,*

those countries that have not exhausted the potential for extensive economic growth, but have not developed the capacity to capitalize and capitalize on investment, innovation and competitive differentiation in order to it reaches among the developed states.

Keywords: *European Union, funds, economic growth, competitiveness*

JEL Classification: *F63, M21, O43*

Introduction

The funds and programs of the European Union contribute directly to the decisions regarding structural changes and to the consolidation of growth and competitiveness in Romania. Romania is one of the main beneficiaries of EU solidarity. The EU funds allocated to Romania amount to EUR 30.8 billion for the programming period 2014-2020, which could represent approximately 2.4% of GDP, annually. By the end of 2018, about EUR 20.8 billion had been allocated for certain projects. Of the total allocation, Romania was paid EUR 7.9 billion according to official data. In addition, through the Mechanism for the interconnection of Europe, EUR 1.2 billion has been allocated to specific projects on strategic transport networks (Dimitriu, Șeitan, Mihăilă, & Manta, 2019). At the same time, research institutes, innovative companies and individual researchers in Romania have benefited from other EU funding instruments, in particular the Horizon 2020 program.

EU funds can contribute to addressing the macroeconomic policy challenges identified in the 2018 recommendations addressed to Romania. Among the actions financed and with an impact on the competitiveness of the business environment include investments in transport infrastructure, energy, water and waste management, in education, employment and social policies, in strengthening healthcare, expanding broadband internet access and development of public administration and interoperable e-government services. During this programming period, 1793 micro-enterprises and 688 SMEs received direct support to strengthen their competitiveness. The SME Initiative generated loans totaling EUR 361 million, supporting 1,344 SMEs. In addition, the European Social Fund is supporting some EUR 473 million of some active measures currently being taken on the labor market, and other EU funds will also allow the recruitment of 174 new researchers. Despite some progress, implementation continues to be delayed in several sectors, including smart, sustainable, and social and connectivity investments.

EU funds can help mobilize private investment. Of the total funding provided by the European Regional Development Fund, EUR 350 million is to be provided through financial instruments and it is expected that they will mobilize additional private investments of around EUR 1 billion¹. The financial instruments of the European Social Fund should in particular support the creation of new jobs and investments in the social economy. However, the implementation stage has not been reached. Romania is making progress in terms of absorption of funds from the European Fund for Strategic Investments, with a total funding of EUR 652 million, which is expected to attract additional public and private investments of EUR 2.7 billion (Dimitriu, Şeitan, Mihăilă, & Manta, 2019).

Research methodology

In order to base the research methodology on the project, we used classical observation and examination instruments, research methods based on the basic principles of scientific research. We used procedures based on factual analysis, intensive documentation at the level of internal and international literature, using the databases and the scientific material existing in the endowment of libraries of specific institutes in Romania and internationally.

The methodology of the paper has as direct instruments the collection of data and information from the literature and from the existing practice in public and private institutions, but especially scientific articles published on specialized research networks (ResearchGate, Academia.edu, etc.), articles published in various journals, relevant books in the field of reference, legislation, analyses and studies, official documents of various tax bodies, tax documents and interactive database of the National Bank of Romania, other relevant sources identified in the libraries: CCFM, Academia Romanian, INCE, IEN, BNR, National Library, INS, etc. Moreover, we analyzed the documents using the comparative, analytical, descriptive method, the no participative and participatory observation, and the use of a set of informational sources, the collection of financial data in the established databases.

The information support of the research was provided by the monographs, books, scientific articles, materials of the scientific conferences, the balance sheets of SMEs during 2008-2017, as well as other materials, which are presented in the scientific papers and publications displayed on the official pages of the national and international research institutes, international financial institutions (research centers), etc. (Manta, 2019).

¹ The data were presented at the International Conference FI-COMPASS, Bucharest, 4-5 July 2019.

Research results

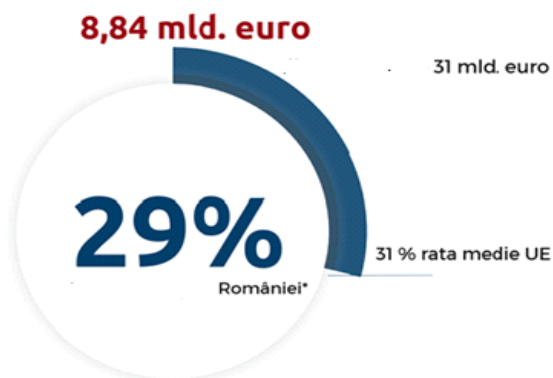
In Romania, the share of innovative companies is below the EU average, and the level of investments made by the business environment in research and innovation is constantly low. Priority investment needs have been identified to strengthen the growth and competitiveness of small and medium-sized enterprises (European Commission, 2019b), and in particular:

- to support the creation of new companies (type of start-up, scale-up), increase their survival rates and increase their degree of competitiveness and internationalization;
- to enhance the innovation capabilities of companies, by introducing product-level, organization or marketing innovations, by offering training courses in innovation management and specific skills for smart specialization, as well as competences with on the results of market research, by supporting key generic technologies and by accelerating market access, as well as by supporting the development of industrial clusters and integrating into research networks based on industry, including by cooperating with countries that fall within the scope of the EU Strategy for the Danube region;
- to facilitate access to finance for small and medium-sized enterprises, including by encouraging start-up and consolidation funding for innovative start-ups with high potential.

According to the reports published by the Ministry of European Funds (2019) on the situation of European funds (MDRAPFE, 2019), it was presented as follows:

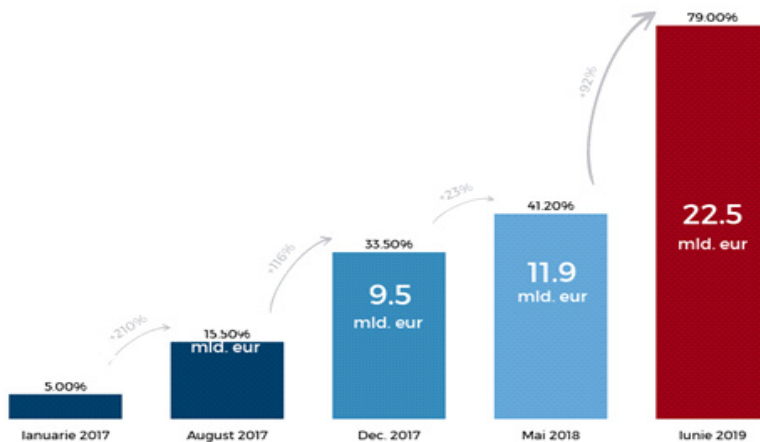
- 8.8 billion euros European money entered in Romania through Cohesion Policy and Agricultural Policy. To these amounts are added another 6.7 billion euros direct payments to farmers;
- approx. 25 billion euros - the total value of the open financing lines, representing over 91% of the total allocation of Romania;
- 43 billion euro the value of the projects submitted for these financing lines;
- approx. 22.5 billion euros the total value of the financing contracts signed. The contracting rate increased more than 15 times, from 5% in 2016 to approx. 79% of the allocation at present.
- The absorption rate of Romania is approx. 29% compared to the EU average, which is 31%.

Figure 1. The amounts reimbursed by the EU to Romania until May 31, 2019



Sursa: <http://mfe.gov.ro/wp-content/uploads/2019/06/ff18ea6dbdf45aa1f620e631d02a74a8.png>

Figure 2. Evolution of the contracting rate of European funds between January 2017 and June 2019



Sursa: <http://mfe.gov.ro/wp-content/uploads/2019/06/fd7a3947b875347b2a3031ed3dd00f96.png>

In the new multiannual financial framework (2021-2027), new financing programs are envisaged that support national competitiveness. The Ministry of European Funds published the architecture of future funding programs in November 2019.

The architecture of the operational programs through which the budget allocated to Romania will be administered between 2021 and 2027 is significantly modified from the current system. According to documents published today by the Ministry of European Funds (MFE), the next financial period brings significant changes in both the institutional and strategic structure. Within the cohesion policy, the Ministry proposes 9 types of programs, the Regional Operational Program to be managed decentralized at the level of the Regional Development Agencies in each of the 8 regions of the country (Polish model) (European Commission, 2019a; Ministry of European Funds, 2019):

1. *The Sustainable Development Operational Program (PODD);*
2. *Transport Operational Program (POT);*
3. *The Smart Growth and Digitization Operational Program (POCID);*
4. *National Health Program (multifund) (PNS);*
5. *The Human Capital Operational Program (POCU);*
6. *Operational Program Helping Disadvantaged People (POAD);*
7. *Operational Program for Integrated Territorial Development (multifund) (PODII);*
8. *Regional Operational Programs - implemented at the regional level (8 ROP);*
9. *Operational Program Technical Assistance (multifund) (POAT).*

The current Big Infrastructure Operational Program (which has the largest financial allocation in 2014-2020) will return to the structure from 2007-2013, the interventions in the Environment field to be taken over by the Operational Program Sustainable Development, and those in the Transport field to pass under a Management Authority within the Ministry of Transport. Separate opportunities will be created for ITI Danube Delta and ITI Valea Jiului.

Moreover, the European Social Fund will no longer finance a Program dedicated to increasing administrative capacity, this intervention being found according to the Ministry among the directions of the future Human Capital Operational Program.

Financing lines for companies

According to the public proposal made by the authorities, the companies will be able to access grants / financial instruments in the following financial period through several programs:

- Regional operational programs will address “smart specialization”, technology transfer, innovation, SME support and digitization;
- The Smart Growth and Digitization Operational Program will provide financial instruments;
- The Operational Program for Integrated Territorial Development will finance interventions in the field of tourism, culture and cultural heritage.
- Priorities defined in support of the business environment:
- Development of an entrepreneurial ecosystem that favors the emergence and maturation of innovative start-up / spin-off;
- Facilitating investments in new technologies - regional interventions;
- Support for internationalization - regional interventions;
- Supporting the adoption of IT&C technologies by SMEs - regional interventions;
- Supporting the clusters in order to integrate them into European value chains - regional interventions;
- Supporting the implementation of the mechanisms of the circular economy within the Romanian enterprises - regional interventions;
- Promote the entrepreneurial spirit, support the entrepreneurial initiatives and the social economy.

Economic sectors with competitive potential in the current context of economic convergence. The analyzes conducted led to the identification of 10 economic sectors with competitive potential that correlate with the areas of intelligent specialization identified in the National Strategy for Research, Development and Innovation 2014-2020 (European Commission, 2019b). At European level, the territorial approach is becoming more and more important in strategic planning. Although traditionally seen as an integral part of Cohesion Policy, space development has received increasing recognition in other EU policies in recent years.

Given the trends at European level of analyzing the territorial component of competitiveness, the European Commission proposed in 2011 the calculation of a Regional Competitiveness Index (ICR). The calculation methodology starts from the premise that in a spatial context economic competitiveness is determined by a complex system of factors, which concentrates, among others: the creative and innovative exploitation of the regional potential, the creation of connections at territorial level by stimulating the appearance and strengthening of the intra and inter-industry value chains, capitalization of natural and cultural heritage, use of research-innovation potential and improving connectivity and accessibility.

ICR is composed of 11 pillars that describe the different aspects of competitiveness (European Commission, 2019a). Through these pillars, the index assesses the strengths and weaknesses of a region. The pillars are classified into 3 groups: elementary, efficiency and innovation. The elementary group comprises 5 pillars: institutions; macroeconomic stability; infrastructure; the health; basic education. These pillars are the essential elementary drivers of all types of economy. As a regional economy develops and progresses, in terms of its competitiveness, factors related to a skilled labor force and a more efficient labor market can come into play. These factors are part of the efficiency group. It comprises 3 pillars: higher education, vocational training and lifelong learning; labor market efficiency; the size of the market. At the most advanced stage of development of a regional economy, the drivers of improvement are part of the innovation group, which consists of 3 pillars: technological maturity; sophistication of the business environment; based on the ICR, whose calculation formula closely follows the Global Competitiveness Index, the map of regional competitiveness at European Union level has been elaborated. Among the countries of the European Union, the development regions of Romania are in the last places both in terms of ICR and in almost all the rankings of the indicators that compose this composite index. The region of the capital has the highest values in terms of competitiveness, but the positive effects on the neighboring regions are limited.

Under these conditions, in the case of Romania, cohesion policy must contribute not only to reducing regional disparities, but also to achieving Romania's competitiveness goals. The results offered by the Competitive Potential Index (CPI) at NUTS 3 territorial level (county) help us to outline some economic aspects related to the diagnosis and the measurement of the economic performance of a territory.

The analysis of the distribution of these values leads to at least two findings:

- an axis of the counties with high values of the Competitive Potential Index, which runs almost diagonally across the country and overlaps the most complete infrastructure in Romania (European, national roads, railways, airports).
- a mosaic aspect of the distribution of this index that overlaps the west, center and south. The east of the country is characterized by a homogeneous distribution of values, which translates into the landscape of economic performance through an inability to make good use of

natural and anthropic capital (low technology transfer, low capital, limitations in the area of polarization of Moldovan cities).

Bucharest - Ilfov is the region of Romania with the highest score (55.92 out of the maximum 100 possible) in the Regional Competitiveness Index 2019, being only 151st out of 268 regions. This, although from the point of view of GDP is at position 25.

In terms of competitiveness, the Bucharest-Ilfov region is similar to Vienna, Antwerpen, Karlsruhe, Prague, but has lower scores on sub-indicators such as macroeconomic stability, compulsory education system, health, labor market efficiency, business sophistication, etc.

It has no indicator to be better placed than the similar regions in the EU, according to the Competitiveness Index published Monday and made every three years by the European Commission.

Bucharest-Ilfov is the only Romanian region in the highest stage of development (NBR 2014-2018), while only three regions reach stage 2—Center, West and North-West—, while all the other four are at the lowest level of development (Dimitriu, Șeitan, Mihăilă, & Manta 2019).

The national average score in the Ranking is 17.84 points and, apart from Bucharest - Ilfov, only the West Region (with 20.9 points) exceeds this threshold. South Muntenia, two places before the Center Region Surprisingly, the total score of the Center is lower, in the Competitiveness Ranking 2019, that registered by South Muntenia: 13.18 (249th place), compared with 15.62 (247th place out of 268).

The North-West region, ranked 246th, has a higher labor market efficiency than existing regions in the EU (Greece, Slovakia, Poland and Romania). In the indicator “Basic education”, all Romanian regions outperform, compared to similar regions in other Member States.

This sub-indicator forms, together with Infrastructure, Health, Institutions and Macroeconomic Stability, the indicator “Basic dimension”, which does not excel any indigenous region. Only South Muntenia (without Bucharest - Ilfov) has performances at the level of similar regions in the EU, in the chapter Basic dimension. In “Innovation”, the following results are inferior to those of the regions of the same grade: North-East, South-East and South Muntenia.

The first place in the ranking is occupied by Stockholm (Sweden), with 100 points, followed by London (UK), with 99.1 points and Utrecht (Netherlands), with 99 points. The last places are occupied by the North Aegean (from Greece) with zero points and the South-East (Romania) with 5.3 points (267 place from 268).

Table 1. Regional Competitiveness Index (IRC)
in the development regions of Romania in 2019

Country	Region	Score/100	Regional classification/268	GDP ranking/268	Development stage
Romania	Bucharest-Ilfov	55.92	151	25	5
Romania	West	20.90	238	222	2
Romania	North-West	17.45	246	244	2
Romania	South-Muntenia	15.62	247	257	1
Romania	Centre	13.18	249	240	2
Romania	South-W. Oltenia	10.57	254	254	1
Romania	North-East	9.05	257	264	1
Romania	South-East	5.35	267	249	1

Source: European Commission Representation in Romania, 2019

The 2019 results of the Index confirm a polycentric model, with a good performance of most of the capitals and regions with large cities, while other regions in the same countries achieve much lower scores, the European Commission statement states.

Conclusion

Entrepreneurship is a pillar of support for the competitive development of the business environment (Manta, 2018). Business start-up and activity is evaluated in the World Bank's annual report, Doing Business, which ranks 190 countries on the basis of a set of 10 indicators, which take into account business regulation and property rights protection, as well as their effects on business, especially on small and medium-sized companies. In 2008, Romania was 48th in the world, and 10 years later, in 2018, it went down 4 positions, up to 52. In the same time period, Central and Eastern European countries have climbed a lot, over 20 of positions: Poland from 74th place in 2008 to 33rd place in 2018, Czech Republic from 56th place in 2008 to 35th place in 2018, both following Romania 10 years ago.

Almost 500,000 SMEs are active on the local market, out of a total of over 25 million small and medium-sized enterprises at EU level, the latest analysis of the European Commission valid at the level of 2018 shows. SMEs account for 99.8% of all EU firms in the non-financial sector, with a similar share in Romania. "The importance of SMEs in the economies of the member countries varies strongly. For example, the EU average in 2018 was 58 SMEs per 1,000 inhabitants, but at the level of member countries there were strong variations, from 29 small and medium-sized enterprises in the

case of Romania, to 115 in the Czech Republic”, according to the report annual report of the European Commission published in October 2019. The local market is not only the last place, but also far from the next ones, namely Germany (35 SMEs per 1,000 inhabitants) and Great Britain (38). What is interesting to note, however, is that the countries in the region of Central and Eastern Europe, those with which Romania is “struggling” in terms of development, average wages or GDP per capita are actually much better placed in terms of regards the indicator of the number of SMEs per 1,000 inhabitants. Funding programs “Romania Start Up Plus” and “Diaspora Start-Up: Find out how many new businesses have been set up and in which areas!” are supporting tools for developing entrepreneurship. Over 8,700 new businesses have been set up through these funding lines, within the 205 projects implemented by the grant managers selected by the Ministry of European Funds (2019), according to data published in August 2019.

In total, the start-ups set up benefit from approximately 384.2 million euros of non-reimbursable European funds for starting and developing the activity and creating at least 2 jobs each. Thus, it is expected that in the next period, the new businesses will generate 17,430 new jobs in the 7 less developed regions of Romania. Most start-ups funded from European funds through RSUP and the Diaspora are in the Center region, with 1,562. Next to the top is the second region of South-Muntenia with 1,418 start-ups, followed by South-West Oltenia with 1,307. In the North-West region there are 1,243 new businesses, followed by the South-East with 1,182, North-East with 1,066, the West region having 937 start-ups set up from European funds. The North-West region is noted by the fact that most of the businesses established are in the IT field, being also the only one in which this field of activity is in the top 3 of the preferences of the entrepreneurs who set up their businesses through these two financing lines. Start-up Nation component settled through Romania Start-up Plus generated 1631 new businesses. Part of the Start-up Nation 2017 program was financed through Romania Start-up Plus through funding attracted by the Ministry for the Environment of Business, Trade and Entrepreneurship. According to the situation presented by the Ministry of European Funds (2019), 1631 businesses were set up that created 4253 new jobs.

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