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## ENTREPRENEURIAL EDUCATION AMONG HIGH SCHOOL YOUTH

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### **Abstract**

*Starting from the premise that the development of entrepreneurial spirit is an educational ideal and entrepreneurial skills are key European competencies, this paper aims to assess the entrepreneurial spirit and intention among high school students, as well as the role of pre-university education institutions in shaping their attitudes and entrepreneurial intentions.*

*To achieve the research objectives, a quantitative research method was employed, and the research instrument used was a questionnaire administered to a sample of 147 high school students. The results reveal that, to foster their entrepreneurial spirit and intention, high school students need appropriate support and guidance from schools, universities, and the community in general. By providing a conducive environment and support in developing entrepreneurial skills, optimal conditions can be created for young people to explore their potential and put their ideas into practice.*

**Keywords:** *entrepreneurship, education, attitude, intention, young people, high school.*

**JEL Classification:** L26, L31, I20.

### **1. INTRODUCTION**

The formation of each individual is influenced by a multitude of factors of cultural, social, economic nature, etc. This formation is achieved through a mix of various types of education. All forms of education, whether formal education (having a systematic, organized, intentional character), non-formal education (being less rigid), or informal education (which is spontaneous and accidental), produce transformations in the values, attitudes, and behavior of people.

Education, as a process and as a specific human activity, aims to shape a model of human personality based on the needs and requirements of the economic, social, and cultural context. Thus, the idea of an educational ideal

emerges, which in Romania is identified, including in the National Education Law, formulated as follows: “the educational ideal of the Romanian school consists of the free, integral, and harmonious development of human individuality, in the formation of an autonomous personality and in the assumption of a value system that is necessary for personal fulfillment and development, for the development of entrepreneurial spirit, for active civic participation in society, for social inclusion, and for engagement in the labor market.”

As it can be observed, “the development of entrepreneurial spirit among young people” is one of the directions towards which the educational ideal of the Romanian school is aimed, demonstrating the importance and interest that the state and government attribute to this field.

From this perspective, following a theoretical and applied research approach, we will analyze the entrepreneurial spirit and intention among high school students as well as the role of educational institutions in the pre-university system in shaping the attitude and entrepreneurial intent of students.

## **2. THEORETHICAL BACKGROUNDS**

Formal and non-formal education in the development of entrepreneurial spirit and intention among high school students acquires different meanings in European countries. Thus, entrepreneurial education (Soare, 2008) can be seen as: a study discipline (already present in the school curriculum); a module of specific courses and activities (sometimes present within formal or non-formal programs); an innovative way to design, organize and develop the entire school curriculum (a restructuring of the school and extracurricular curriculum from the perspective of entrepreneurial education requirements, desirable to implement).

In our country, the main means by which formal education in the field of entrepreneurship is carried out is represented by the mandatory discipline „Entrepreneurial Education” which, starting from 2003, was introduced into the framework education plan for high school in the 10th grade, all streams, profiles and specializations, being granted one hour per week, so approximately 35-36 hours in a school year. The school curriculum related to the Entrepreneurial Education discipline, approved by Order of the Minister of Education and Research No. 4598 / 31. 08. 2004, (ME, 2004) lists the general and specific skills that should ideally be formed after completing the mandatory hours of Entrepreneurial Education. General and specific competencies are based on and promote the following values and attitudes: independence in thinking and in action; positive relationship with others; responsibility in entrepreneurial activity; free initiative; economic efficiency.

Despite the knowledge and skills acquired in schools, Romania does not have a high level of entrepreneurship. One of the factors that contributed to this state of affairs, in addition to the mentality strongly influenced by communist

doctrine and the low level of economic development in the post-communist period, is also the prevalence of the cognitive component over the attitudinal one, in the vast majority of study disciplines, including entrepreneurship education. Thus, students have knowledge, develop skills but do not necessarily have the attitude necessary to materialize them.

As proof, there is also the latest Country Report published by the Global Entrepreneurship Monitor in 2023, (GEM, 2023) which shows that in 2022, only 6% of Romanian adults intended to start a business in the next three years, decreasing compared to 15% a year earlier. At the same time, almost half of Romanian adults knew people who had recently started a business, so there is no lack of role models, while two thirds considered that they have the skills and experience to start a business themselves, so there is no shortage trustworthy. The decrease in entrepreneurial intention from 2022 is noticeable not only in the case of Romania, being a general trend in the area, probably influenced by the war in Ukraine.

In some cases, the entrepreneurial intention is influenced by the social perception of entrepreneurs, by the status that entrepreneurs have in society and by the way the mass media present entrepreneurs. Thus, society must be educated in order to develop a positive attitude towards entrepreneurship (Boldureanu *et al.*, 2020), potential entrepreneurs must be encouraged and supported by those around them, by society in general.

In this context, it is necessary to introduce optional classes, which will also take place in educational institutions, but will be different due to the applied non-formal education methods.

The notion of non-formal education appeared in the 1960s - 1970s, being associated with lifelong learning, outlining the importance of education that takes place beyond the formal framework of the education system, even if it takes place in other spaces than those of school, whether it is carried out at school but through activities that are not the subject of the school curriculum (Costea, Cerkez and Sarivan, 2009).

According to the National Education Law no. 1/2011 learning in non-formal contexts is learning integrated within planned activities, with learning objectives, which do not explicitly follow a curriculum and may differ in duration. This type of learning depends on the intention of the learner and does not automatically lead to the certification of the acquired knowledge and skills and the institutions or organizations in which it is carried out are those in which formal education is carried out, to which are added „*care and protection centers of the child, student clubs, cultural institutions such as museums, theaters, cultural centers, libraries, documentation centers, cinemas, houses of culture, as well as professional, cultural associations, unions, non-governmental organizations*” (Law no. 1/2011).



Non-formal entrepreneurship education will aim to develop a positive attitude towards entrepreneurship, taking into account the fact that attitudes best predict subsequent behaviour. Attitudes influence intentions (Boldureanu *et al.*, 2013) and intentions represent individual motivations to exert effort in order to act on a plan or a decision.

### **3. RESEARCH METHODOLOGY**

Starting from the premise that the development of entrepreneurial spirit is an educational ideal and entrepreneurial skills are key European competencies, this paper aims to assess the entrepreneurial spirit and intention among high school students, as well as the role of educational institutions in the pre-university system in shaping attitudes and intentions towards entrepreneurship among high school students, with the following objectives:

O1: Analysis of entrepreneurial spirit among high school students;

O2: Research on the perception of entrepreneurship among young individuals;

O3: Self-assessment of the level of entrepreneurial knowledge among high school students;

O4: Analysis of entrepreneurial intentions among high school students;

O5: Identification of ways in which schools could contribute to the enhancement of entrepreneurial education and intentions.

In order to achieve the research objectives, a quantitative research method was used, and the research instrument was a questionnaire administered to a sample of 147 high school students from the 10th, 11th, and 12th grades at the „Ioan C. Ștefănescu” Technical College in Iași, specializing in „Gastronomy Technician” and „Hairstylist”. These students attended Entrepreneurship Education courses, as well as other courses such as Accounting, Marketing, Business Administration, Negotiation and Contracting, courses included in the curriculum for the Services Profile. The students voluntarily completed the questionnaires, receiving the link through their class communication groups and their responses remained anonymous. The questionnaires were filled out between May 2nd and May 19th, 2023, near the end of the school year, when the subjects relevant to each year of study were almost entirely covered.

### **4. RESULTS AND DISCUSSIONS**

Following an investigative process involving induction, deduction, statistical analysis, and critical interpretation of the results, the following findings were obtained:

For *Objective O1: Analyzing Entrepreneurial Spirit Among High School Youth*, six items were proposed to examine to what extent young individuals possess qualities that could indicate entrepreneurial intentions in the future. These qualities include risk-taking, independence, openness to innovation, the

desire for achievement, determination, and perseverance. Based on the responses provided by students, it can be concluded that the interviewed youth possess qualities indicative of entrepreneurial spirit, being willing to take risks, independent, determined, persevering, and having a desire for accomplishment. Regarding openness to innovation, it seems that they need to be encouraged and motivated to seek the new, as they are still under the influence of traditionalism, which characterizes our people.

For *Objective O2: Researching the Perception of Youth Regarding Entrepreneurship*, several questions were posed focusing on the qualities that young individuals believe an entrepreneur should possess and how they view an entrepreneurial career. Concerning the qualities that young people think an entrepreneur should have, most responses indicated: knowledge of the field, responsibility, decision-making ability, intelligence and creativity, passion for business, vision, etc. The youth who completed the questionnaire are familiar with entrepreneurs (friends, relatives, bosses or supervisors, neighbors, acquaintances, teachers, etc.), some of them coming from families that have or had a business. Knowledge of the field and responsibility are the most important qualities an entrepreneur should possess, according to the interviewed students. The emphasis is placed on the support provided by school and authorities for establishing a business.

For *Objective O3: Self-assessment of the Level of Entrepreneurial Knowledge Among High School Youth*, students were asked if they have entrepreneurial skills and knowledge, if they believe they know how to initiate and develop a business, if they have ever developed a business plan, and if Entrepreneurial Education and other economic disciplines studied have helped them develop entrepreneurial competencies. The responses showed that the level of knowledge in entrepreneurship is average for 53.4% of students, followed by those who consider themselves to have minimal knowledge (29.5%), and only 17.1% of students believe they have a good level of knowledge and skills in entrepreneurship.

On a more concrete level, when asked if they would like to initiate and develop a business, 45.5% of them claim to know the requirements and steps to initiate a business, 33.8% are undecided and 20.7% do not know or have little knowledge. Regarding the development of business plans, the majority (58.9%) claim they have not developed any, while 41.1% of students state that they have developed a business plan during Entrepreneurial Education classes. Additionally, young individuals believe that Entrepreneurial Education and other economic disciplines studied have helped them develop entrepreneurial competencies.

For *Objective O4: Analyzing Entrepreneurial Intentions Among High School Youth*, the intentions of young individuals to become entrepreneurs were assessed. This involved evaluating if they have seriously considered initiating a business, if they currently have a business idea, if they would like to open a business in the next 3-5 years, the field in which they would like to open a business, and what they consider to be the biggest obstacle in starting a business.

In response to the question „Have you seriously considered becoming an entrepreneur”, 59.6% of respondents answered yes, while 47.9% of the total respondents even have a business idea at the moment. Regarding the desire to open a business in the next 3-5 years, 71.9% of the young people who completed the questionnaire answered yes. The fields in which they would like to open their businesses are as follows: Beauty Services ranked first (with 40 responses), closely followed by Commerce (39 responses), and then equally by Production and Tourism (each with 32 responses), and Catering (27 responses).

The fields in which they would like to open their businesses are largely influenced by the professional qualifications they will acquire upon completing high school studies, namely, Technician in Gastronomy and Hairstyling. Among the obstacles mentioned in starting a business, more than half (52.1%) of respondents mentioned a lack of necessary funds, followed by the challenging implementation of the business idea (18.5% of respondents) due to various reasons (lack of knowledge, skills, lack of tutorial support), and a lack of a business idea (in the case of 17.8% of respondents).

In conclusion, the majority of young individuals have considered becoming entrepreneurs, some even have a business idea, many aspire to open a business in the next 3-5 years, especially in the field they are preparing for. The main obstacle in starting a business seems to be the lack of funds.

For *Objective O5: Identifying ways in which the school could contribute to increasing the level of entrepreneurial education and intention*, the role of the school in developing entrepreneurial attitudes and intentions was investigated. From this perspective, students asserted that:

- entrepreneurial education can develop entrepreneurial intention. Data analysis showed that the majority of students believe that entrepreneurial education can develop entrepreneurial intention to a large extent (54.8%) and a very large extent (14.4%);

- mentorship and coaching activities are very useful in the initial stages of business, followed by entrepreneurship skills training and information on legal, accounting, and tax procedures.

As a result of the research conducted, the majority of students (87.0%) believe that the education system/institutions should do more to develop entrepreneurial intention among students. The methods suggested by the youth include: more hours of entrepreneurial education; more economic disciplines; financial education hours to learn how to manage money; starting entrepreneurial education as early as possible; interesting and interactive lessons; more emphasis on practical training; meetings and discussions with entrepreneurs; visits to companies; the opportunity to receive advice from entrepreneurs, etc.

In conclusion, high school students believe that the education system can and should contribute to the development of entrepreneurial intention, both

through formal means (mandatory hours in the curriculum) and especially through non-formal means (optional hours, projects, activities, meetings, conferences, visits) or even informal means (discussions, mentorship, etc.).

## 5. CONCLUSIONS

In the current period, there is a significant increase in the interest of high school students in entrepreneurship. Many young individuals are drawn to the idea of building their own business and fulfilling their own dreams, rather than following traditional paths and employment methods. This growing interest may result from a better awareness of the entrepreneurial profession. Developing an entrepreneurial spirit at this stage of life can bring both individual and collective benefits, fostering critical and creative skills, providing access to technological opportunities, offering appropriate support, and generating social and economic impact.

The research process revealed the following:

- the interviewed young individuals possess qualities indicative of an entrepreneurial spirit, being willing to take risks, independent, determined, perseverant, and having a desire for affirmation. Regarding openness to innovation, they seem to need encouragement and stimulation to explore the new, still being under the umbrella of the traditionalism that characterizes our people.

- high school students are acquainted with individuals who are entrepreneurs (friends, relatives, bosses or supervisors, neighbors, acquaintances, teachers, etc.), with some of them coming from families that have or had a business. They view knowledge of the field of activity and responsibility as the most important qualities an entrepreneur should possess.

- high school students believe they possess certain entrepreneurial qualities; most of them consider their entrepreneurial knowledge to be moderate and know how to initiate and develop a business. Less than half of them have drafted a business plan; most believe they would need support in creating a business plan, especially in disciplines such as Marketing, Acquisition, and Accounting. The majority believe that the studied disciplines have helped them in developing entrepreneurial knowledge and skills;

- a majority of young individuals have considered becoming entrepreneurs, with some already having a business idea. Many aspire to start a business in the next 3-5 years, especially in the field they are preparing for. The main obstacle to starting a business is perceived to be a lack of funds.

- high school students believe that the education system can and should contribute to the development of entrepreneurial intentions, both through formal means (mandatory hours in the curriculum) and especially through non-formal means (optional hours, projects, activities, meetings, conferences, visits, etc.), and even informal means (discussions, mentorship, etc.).

To develop their entrepreneurial spirit and intention, high school students need adequate support and guidance. Schools, universities, parents, and the community, in general, can play an important role in providing educational programs, mentorship, and access to resources. By offering a favourable environment and support in developing entrepreneurial skills, optimal conditions can be created for young people to explore their potential and put their ideas into practice.

By providing a environment and support in the development of entrepreneurial skills, optimal conditions can be created for young people to explore their potential and put their ideas into practice.

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## ENHANCING PAINTER IDENTIFICATION THROUGH STATE-OF-THE-ART ARTISTIC IMAGE RECOGNITION TECHNIQUES

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### **Abstract**

*In this work, we will present a project through which we aim to recognize an artist whether we are in front of the painting in a museum, or whether we are on the street or in our own homes. For this, by simply uploading an image to the application, it will recognize the artist with considerable accuracy and provide us with certain details about the painting. itself, about the artist and about the current that influenced this painting.*

**Keywords:** *Painter identification, ResNet, MobileNet.*

**JEL Classification:** C38.

### **1. EXISTING WORK**

In (Keren, 2002), the author uses the discrete cosine transforms, a mathematical method for analysing and representing compressed pictures, and it serves as the foundation for the classification process. By using this technique, the classifier can successfully differentiate between various types of paintings based on their distinctive visual characteristics. Using a diverse set of picture characteristics and image modifications to represent three distinct art domains, (Shamir et al., 2010) presents a method for automatically recognizing nine different artists. The method makes use of image features. The authors achieved a classification accuracy of 77% by using a dataset consisting of 360 training photos and 153 test images to categorize paintings according to the artists who created them.

ArtHistorian is a categorization and indexing system based on content that shows images using a set of criteria with tiny dimensions and simply understandable global data (Gunsel, Sariel and Icoğlu, 2005). The authors employed 290 distinct paintings with styles ranging from two to twenty-ten to evaluate their algorithms' capacity to categorize data. The authors say that by

utilizing this basic model, they were able to achieve noteworthy results, including accuracy gains of 86,51% with a plain Bayesian classifier.

In (Shen, 2009), the author presents a comprehensive analysis of diverse techniques employed for artist identification and furnishes a structured approach for categorizing classical Western paintings. The corpus comprises a total of 1,080 images, which have been sourced from 25 renowned classical painters. The framework proposed is founded on both global and local texture attributes, in addition to global colour and form attributes. The employment of a radial basis neural network in classification yields an identification accuracy of 69.7%.

According to (Viswanathan, 2017), this solution was able to achieve a prediction performance of 90% with a margin of 3 artists for each artwork. This information can be found in the research that was conducted. In (Lombardi, Cha, and Tappert, 2004), the authors obtained an accuracy rate of up to 85% for certain artists following the use of a combined total of 100 train data and 80 test data. In spite of this, the authors were eventually able to arrive at an accuracy rate of 71.9% after expanding the margin of error to cover all artists.

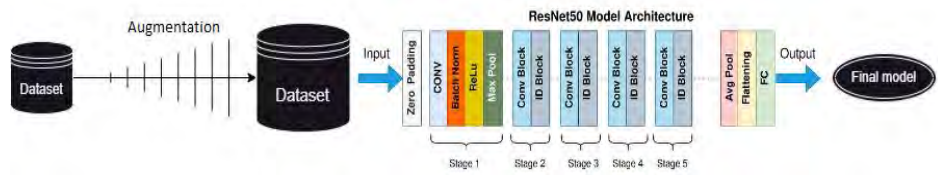
When we look at the papers that have been supplied up to this point, we are able to see very clearly the differences that exist, distinctions that belong not only to the dataset but also to the augmentations and the development of the model that is being discussed here. A further important distinction would be that all of the components are still in the stage of inquiry; as a result, there is no application that has been constructed to serve the end client of the project. This is one of the main differences between the two types of projects. In addition to the two factors that were just covered, there is also the question of accuracy, which is an area in which our project shines, both in terms of the number of individual artists whose predictions were accurate and in terms of the overall number of accurate estimates for each artist.

Based on the various factors that we have considered; we have reasons to believe that the research we conducted and the efforts we exerted have yielded a significant discovery. This discovery can be incorporated into a program that is capable of effectively fulfilling all of its intended functions. Our confidence in this conclusion is supported by the careful analysis we have conducted, taking into account various variables and factors that could impact the outcome of our research.

## **2. PROPOSED SOLUTION**

During the process of building this project to determine the artist of a painting based on a photograph of the work, we utilized a number of different augmentation strategies to improve the quality of the training data before introducing it to the model, as shown in Figure 1.

To improve the variety and unpredictability of the training set, augmentation entails applying alterations to the pictures in order to achieve this goal. These transformations can include *blurring*, *adding salt and pepper noise*, *rotation*, and *zooming*.

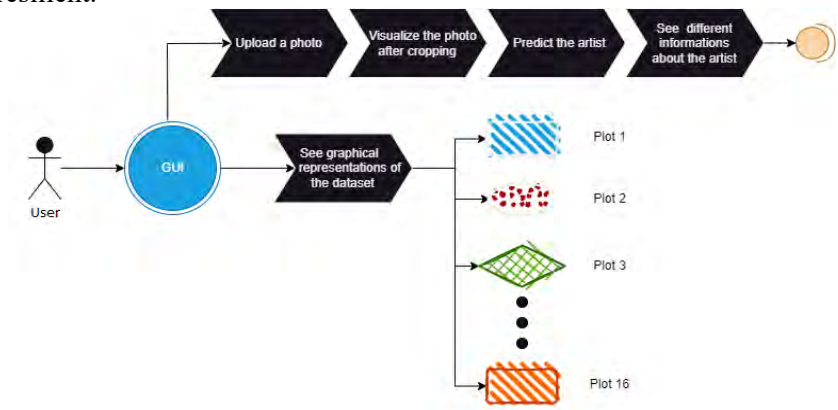


Source: computed by authors

**Figure 1. Dataset augmentation and the use of it**

The model is able to handle pictures collected from a variety of angles or orientations with the assistance of rotation augmentation, which enables it to learn elements that are consistent regardless of where the artwork is placed. The data is improved by zooming in, which presents the model with multiple scales of the painting. This allows the model to be more adaptive to the varying picture sizes that occur in real-world situations.

During the process of developing this application, we made use of two widely used convolutional neural network designs, namely ResNet (Targ, Almeida and Lyman, 2016) and MobileNet (Sinha and El-Sharkawy, 2019), in order to evaluate how well each one does its job of recognizing the artist. Both ResNet and MobileNet (Mohapatra et al., 2021) are examples of deep learning models that are well-known for their efficiency in the performance of image classification tasks. In general, the incorporation of various augmentation strategies as well as the use of ResNet and MobileNet models was an essential stage in the development of my project. This stage contributed to the model’s capacity to identify artists based on paintings in a manner that was more accurate and resilient.



Source: computed by authors

**Figure 2. App architecture use case**



The user's experience using the application, presented in the diagram above (Figure 2), is intended to be both simple and enlightening throughout the entirety of the interaction process. When the user first opens the program, they are given two primary alternatives to choose from: (1) *upload a photo* to the application or (2) *examining dataset plots*.

If the user decides to *upload a photo*, they have the option of choosing an image from their own device to use the program's cropping feature to isolate the artwork and its key characteristics. This phase of cropping guarantees that the model's attention is entirely directed toward the pertinent artwork and removes any superfluous or irrelevant background material. After the image has been analysed, the program makes use of an advanced machine learning model to make a prediction regarding the artist based on the attributes that were extracted. After the prediction has been made, the user is shown further information about the artist who has been recognized. In addition to this, the application provides information on the art movement or style to which the artist belongs, providing a historical and cultural context for the artwork. Users are able to cultivate a more profound respect and comprehension of the artist's contribution to the world of art as a result of reading this material.

Users also have the option to *investigate the dataset plots* that are contained within the program itself. These plots provide visual representations of many features of the dataset, such as the distribution of artists, the frequency of different art movements, or any other relevant statistical analysis. For example, one plot may show the frequency of art movements, while another plot may show the frequency of distinct art movements. Users are able to get insights into the dataset as a whole by utilizing this function, as well as investigate patterns or trends among artists and art movements.

The user may engage with the program on a global scale by either uploading and evaluating their own photo or examining the plots of the dataset. In both instances, the objective is to give users an experience that is both entertaining and informative. This will allow users to explore and learn more about artists, the artwork they created, and the larger art movements in which they participated.

## **2.1 Image Augmentation**

We start with 8,450 paintings from 50 different artists taken from the Best Artworks of All Time dataset. On average, each artist has contributed approximately 170 paintings to our collection. However, it is important to note that some artists have provided more paintings than others. In fact, there is one artist who has only contributed 10 paintings, which is significantly less than the average. We would need another artist to contribute an equivalent quantity of paintings, like 330, to balance the aforementioned one. The issue of uneven and poorly balanced numbers of paintings among different artists has led us to

explore various augmentation techniques to significantly increase the size of our dataset. By doing so, we hope to address the inconsistencies and ensure that our dataset is more representative and comprehensive. The practice of attributing paintings to artists is not primarily aimed at increasing the number of works by well-known artists. Rather, it is intended to boost the number of paintings associated with artists who have produced only a limited number of works. In other words, the focus is on those artists who have a relatively small body of work to their name. By utilizing this approach, we are able to address not only the discrepancies associated with the distribution of paintings but also furnish the model with a greater amount of information for both training and testing. This increased amount of data will ultimately lead to a more precise and accurate model, resulting in a solution that produces favourable statistics and outcomes.

The end outcome, which could be taken into consideration in the final work, was to multiply the number of existing photographs by seven to arrive at a total of 59,150 pictures, with an average of 1,183 pictures produced by each artist. This increase is advantageous both in terms of the accuracy of the model and by reproducing some of the common conditions of photography in a museum. These factors include a loss of focus, different lighting, or even the function of the phone that many people still have active, which is the mirroring of the image. All of these variables have been taken into consideration in order to recreate the scenarios that have been described and educate the model using them as well. While the operations may seem simple, they are in fact fundamental and highly effective in the process of training the model. These operations form the building blocks upon which more complex operations can be built and are essential in ensuring that the model is able to learn and adapt to new data. Despite their simplicity, these operations have been rigorously tested and proven to be highly effective.



Source: computed by authors

**Figure 3. The results of data augmentation**

As depicted in the image above (Figure 3), it is evident that the original image placed at the centre has undergone a series of transformations, resulting in six different augmented versions. Each of these versions is unique in its own way and showcases the diverse possibilities of image augmentation techniques. For two of them, the contrast level was changed to simulate distinct warm or cool lights that may place these paintings in the limelight. Additionally, a random rotation between  $-10$  and  $10$  degrees was picked to simulate the erroneous orientation of the phone when the photo was shot. This was done to simulate the effects of shaky hands. For the other two, a Gaussian blur was used to simulate the lack of focus on the phone; the so-called salt and pepper [5] filters were added to simulate the noise that older generations of cameras produce; and the paintings were randomly rotated between  $-15$  and  $15$  degrees. This is how the number 2 came about, as the only difference between these two is the degree to which the paintings have been rotated. Additionally, a Gaussian blur [6] was applied to the last two, and auto contrast was utilized. In addition to this, the picture was cropped by using a random value between 0 and the modulus of the value between height and width. This was done after the previous step had been completed. After that, the picture was flipped horizontally by a random number of degrees ranging from  $-5$  to  $5$ , and finally, a mirroring operation was carried out to reproduce the function described above.

To further enhance the training process, an additional augmentation technique is applied to the data. In addition to the augmentations mentioned

earlier, such as rotation, scaling, and translation, a horizontal flip is also performed on each image during the parsing stage. This technique involves flipping the image horizontally, which effectively doubles the amount of training data available. By incorporating this technique into the training process, the model is able to learn from a more diverse range of images and improve its ability to accurately classify new data.

## **2.2 Image Cropping**

As the development of the app progressed, another issue arose. It was discovered that there was a specific image in a museum that posed a challenge for the future user. Despite the app's capabilities, it would not be possible for the user to completely eliminate all the distracting elements surrounding the image. One such element was the presence of people in the frame, which proved to be a significant obstacle. It is quite common to find ourselves in a room where various exhibits are on display, surrounded by other people. However, it is important to remember that not everyone present may have the same intentions. Some individuals may wish to capture a specific moment in time through photography or other means, but this can be difficult when others are not considerate of their desire to do so. Therefore, it is important to be mindful of others and their intentions when visiting such spaces. Capturing a painting through photography can be quite challenging, especially in popular museums where the number of visitors can easily reach thousands. In such cases, it's practically impossible to have an ideal setting for photography, and monopolizing a painting for this purpose may not be feasible.

One of the best ideas was cropping the painting to emphasize its unique features that are relevant to prediction. This approach aims to avoid any interference with the artwork's main characteristics that are unrelated to the prediction task. By focusing solely on the relevant aspects of the painting, the predictive model can make accurate predictions without being influenced by irrelevant information. The process of extracting a well-defined rectangle can be quite challenging, and it's not uncommon to encounter difficulties along the way. However, with perseverance and dedication, it's possible to arrive at a solution that meets all the necessary criteria. In this case, despite initial setbacks, you were able to devise an optimal solution that effectively addressed the problem at hand. To successfully implement the plan, it is important to follow a series of steps. These steps will guide the user through the process and ensure that everything is done correctly. The following are the steps that should be taken during implementation:

- Convert the image to grayscale;
- Apply a bilateral filter to reduce noise while preserving edges;
- Detect faces in the photo using OpenCV's face detection algorithm (Khan et al., 2019);

- Create a mask to exclude any faces outside from the painting detection;
- Apply the mask to the photo to exclude any faces from the painting detection;
- Detect edges in the filtered image using the Canny algorithm (Song, Zhang, and Liu, 2017);
- Dilate the edges to connect any gaps and close contours;
- Find contours in the dilated image;
- Select the contour with the largest area that is not too large;
- Exclude any contours that overlap with the detected faces;
- Create a mask for the painting by filling in the selected contour;
- Apply the mask to the original image to extract the painting;
- Get the bounding box of the painting;
- Crop the painting from the photo.

Based solely on the visual evidence presented through the images we tested and experimented with, it appears that the algorithm is functioning as intended. Specifically, the algorithm seems to successfully identify and extract the primary image from within a given frame.



Source: computed by authors

**Figure 4. The results of image cropping at the level of mobile application**

This primary image is defined as the largest image present, with smaller elements being excluded from consideration. In addition to its ability to process images with standard frames, the algorithm is also capable of handling images with paintings that feature irregular frames, as demonstrated in Figure 4. It is not

very common to come across paintings that have frames of various shapes. However, having a frame that complements the painting's shape and this implementation can prevent the artwork from being cropped poorly and the overall aesthetic from being compromised. This is especially important when considering the accuracy of the painting's presentation and how it will be perceived by viewers.

### 2.3 Flickr API

The Flickr API is an incredibly useful resource for developers who want to tap into the vast collection of images and metadata available on the Flickr platform (Van Zwol, 2007). With this powerful tool, developers can easily access a wealth of information about photos, including their *titles*, *descriptions*, *tags*, and more. This makes it possible to create all sorts of innovative applications and services that leverage the rich content available on Flickr. Whether you're building a photo-sharing app, a search engine, or a recommendation system, the Flickr API provides a flexible and powerful way to access the data you need.



Source: computed by authors

**Figure 5. Images retrieved by Flickr API**

The viewer is provided with the option to examine photographs linked not just to the artist but also to the particular movement that the artist was involved in at the time. In the image that was just provided to us (Figure 5), it is quite apparent that by beginning with the name of the artist, we are able to quickly extract five additional photographs that are related to the term that was defined. We get the name of the artist as well as five photos relating to the art movement, so that we may have a more comprehensive understanding of the artist and the origins of the movement.

By seamlessly incorporating the image links that we had retrieved into our application's user interface, we were able to craft a display that not only highlighted the artist and their masterpiece but also offered valuable insights into

the art movement they were associated with. The end result was not meant to catch the user's attention but to provide them with a wealth of information about the artwork and its historical context. With this approach, we were able to create a truly immersive experience for the user, one that not only showcased the beauty of the artwork but also provided them with a deeper understanding of its significance.

### 3. MODELS

The process of developing a model that can accurately recognize a painting is a complex one that involves multiple stages of modifications and fine-tuning. Each step is crucial in ensuring that the final result is valid and can be considered a good variant in the development of the application. Through careful analysis and testing, the model is refined to achieve the highest level of accuracy possible. This level of precision is essential in ensuring that the application can be relied upon to recognize paintings with a high degree of certainty. Overall, the development of such a model is a challenging but rewarding process that requires a great deal of expertise and dedication. In the following section, we will delve into the detailed steps that were taken to enhance the accuracy of the model. Each step was carefully considered and implemented to address any potential issues that could have impacted the model's accuracy. By following these steps, we were able to significantly improve the model's accuracy and ensure that it was able to provide reliable and accurate results. So, let's dive into the steps taken to enhance the accuracy of the model:

- Load the pre-trained model.
- Finish off with more layers.
- When training, include the ReduceLROnPlateau parameter.
- Train all of the model's layers.
- Freeze some core ResNet layers.
- Add ReduceLROnPlateau when training.
- Add also EarlyStopping (Bai et al., 2021) when training.
- Train the previously determined layers once more.
- Combine the records of the two types of training.
- Plot the training graph.
- Print the correctness of the data on both the train and the cross validation.
- Save the model.
- You may print off some helpful graphs to understand how the accuracy relates to each individual artist.

Although ResNet (He et al., 2016) and MobileNet (Sinha and El-Sharkawy, 2019) were designed using different architectural ideas, they have a few things in common. Both models extract features using convolutional layers and are

based on deep convolutional neural networks (CNNs). They make use of batch normalization in order to increase the stability of training, and they make use of ReLU activation functions in order to add non-linearity. In addition, both architectures are trained with different variations of stochastic gradient descent (SGD), and they use anti-overfitting methods like weight decay and dropout regularization. Both of these methods are used to prevent the models from becoming too accurate. The best results were obtained with ResNet and were around 99.96% accuracy on training data and around 93.28% accuracy on cross validation data.

#### 4. CONCLUSIONS

The purpose of this project was to create an artistic image recognition system that would be able to determine the name of the painter based on a photograph of a work of art displayed in a museum. In order for the system to accomplish this objective, it made use of two well-known convolutional neural network (CNN) models. These models are ResNet and MobileNet. Throughout the whole of the research, substantial progress was made in identifying artists based on pictures of their paintings. The employment of ResNet and MobileNet models produced outstanding results, with an accuracy rate that was above 90% for the bulk of the artists included in the dataset. These findings can be found in the dataset. This accuracy is superior to the results that have been published in other relevant publications, which demonstrates that the dataset that was utilized in this study is better. In addition, the creation of an integrated application that allows users to submit images, crop them, and acquire forecasts of the artist proved to be a vital contribution to the project. The program not only correctly identifies the artist, but it also offers users other information, such as an overview of the art movement that was significant in the development of the artist's work, relevant photos obtained using the Flickr API.

In conclusion, the research was successful in developing an artistic image identification system that is able to identify the creator of a painting based on a photograph of the work shown in a museum. The employment of ResNet and MobileNet models, in conjunction with a dataset of superior quality, led to an accuracy rate that was more than 90% for the majority of artists. The addition of an application, which included detailed information on the artist and the work they had created, made the user's whole experience even more enjoyable.

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## IDENTIFICATION OF ANIMALS OF SIGNIFICANT ZOOTECNICAL VALUE

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### **Abstract**

*Biometric identification has brought about profound change in a variety of fields, and its enormous potential in zootechnics has attracted considerable interest. The primary purpose of this paper is to explore the practical application of biometric technologies for the purpose of identifying cattle in a unique manner. Utilizing these cutting-edge technologies, the research seeks to develop a comprehensive understanding of how biometrics can be used to establish the unique identity of individual cattle samples.*

**Keywords:** *Biometric, SIFT, SVM.*

**JEL Classification:** C38.

### **1. INTRODUCTION**

Individual animal identification is essential for a variety of purposes. *First*, it facilitates animal tracking during epidemics and other emergency situations. By maintaining precise records of each animal's movements, it is simpler to identify potential sources of contamination and swiftly contain an outbreak. *Secondly*, animal identification helps prevent the abduction of zootechnical significant animals. The reproductive history or performance records of some animals make them more valuable than others. By precisely distinguishing each animal, it becomes significantly more challenging for criminals to sell these animals on the illicit market. *Lastly*, animal identification enables optimal livestock management through the recording of animal performance and output. Farmers can make better decisions regarding reproduction, nutrition, and other aspects of livestock management if they keep accurate recordings of each animal's behavior, health, and productivity. The solution from this paper has the potential to significantly advance zootechnics by utilizing biometric technologies to identify and manage cattle in a unique manner. Traceability,

animal welfare, genetic improvement, and breeding programs are all enhanced by biometric identification. In addition, it enables precise livestock management by providing real-time data for making informed decisions. Exploring the advances in biometric technologies and their application in this field contributes to the creation of innovative livestock management solutions. This research has the potential to make a significant contribution to the scientific community and advance biometric identification practices for zootechnical animals.

## 2. EXISTING WORK

Research in livestock biometrics (Bello et al., 2020) has demonstrated that cattle can be identified through their *nose* prints. The research has revealed the potential of using *cattle muzzle prints* as a dependable biometric identifier, which presents promising opportunities for progress in livestock management. Studies consistently demonstrate the uniqueness and consistency of cattle muzzle prints over time, confirming their viability for individual identification of cattle. *Cattle muzzle prints* have potential as a unique biometric marker to improve cattle management practices. Researchers have utilized advanced image processing techniques to extract and analyze distinctive characteristics found in the nose prints of cattle, facilitating accurate identification. The comprehension of biometric technology enables livestock managers and researchers to create advanced systems that enhance cattle management in areas such as precise record-keeping, enhanced traceability, efficient disease control, and sophisticated genetic analysis. The incorporation of image processing methods into cattle management practices represents a significant shift towards the utilization of biometrics as a valuable tool. Utilizing the unique characteristics present in bovine muzzle prints, ranch managers can establish reliable identification systems that enable individual animal tracking and optimize operational efficiency. This innovation has the potential to transform conventional livestock management practices, resulting in improved efficiency, precision, and animal welfare. The current research on utilizing cattle nose prints as a distinct biometric marker is a noteworthy achievement in the field of livestock management. Advancements in biometrics have made cattle management using this technology more feasible and promising. The utilization of biometrics in cattle management offers promising opportunities for enhancing traceability, disease control, and livestock welfare through advanced image processing methods that extract and analyze distinctive characteristics. This study presents a methodology for identifying bovines through their unique muzzle characteristics. The objective is to create a precise and reliable method that utilizes the distinctive features present in the muzzles of cattle. The researched methodology investigates the use of sophisticated image processing methods and biometric algorithms to accurately analyze and compare muzzle characteristics.

*Nose printing* is a livestock identification technique that utilizes the distinctive patterns of lines and dots found on the nose of an animal (Priesnitz et al., 2021). This method is based on the premise that each animal has a unique nose print that can be used for identification purposes. Just like humans have unique fingerprints, animals also have distinct patterns that are exclusive to each individual. These patterns can serve as a reliable method of permanent identification. Nose printing is a reliable method of identification for livestock, specifically sheep and cattle, in sale and exhibition settings.

*Touchless technique in cattle identification* is similar to the touchless 2D fingerprint recognition technology (Bazen et al., 2020). The notion of touchless fingerprint recognition refers to the process of extracting fingerprint characteristics without the need for physical contact with a finger scanner. Thus, a non-invasive method could be employed to obtain distinctive characteristics from a cow's body, such as nose prints, without the need for physical contact or ink application. *Cattle muzzle print identification*, also referred to as muzzle pattern recognition or nose print identification, is a biometric technique that is utilized to distinguish individual cattle by analyzing the unique patterns present on their muzzles. Cattle muzzle prints have distinct characteristics that are comparable to those found in human fingerprints, rendering them useful for identification objectives. This method involves a series of essential steps, which include image acquisition, pre-processing, feature extraction, matching, and classification. These steps play a key role in accurately identifying cattle based on their unique muzzle prints. In order to improve the quality and clarity of muzzle print images, a range of image processing algorithms can be utilized, including but not limited to edge detection, segmentation, and normalization. Various feature extraction methods are commonly used. These methods include local binary patterns (Pietikäinen, 2010), Gabor filters (Mehrotra, Namuduri and Ranganathan, 1992), texture analysis techniques (Tuceryan and Jain, 1993) and various operators for edge detection (Ziou and Tabbone, 1998). The objective of these techniques is to identify and extract the distinctive characteristics of the muzzle patterns and present them as feature vectors for an easier comparison. In addition to applying feature extraction methods, researchers have employed various models to establish the correlation between cattle muzzle prints. Support Vector Machine (SVM) (Noble, 2006) models have been widely used in various applications. The models required training using broad datasets of muzzle prints, which helped in accurately correlating the animals.

### **3. PROPOSED SOLUTION**

The objective of this study is to make use of image processing techniques to accurately identify cattle by analyzing their unique muzzle prints. The main goal is to create a precise and effective technique that can consistently identify individual cattle by examining their distinct muzzle features. The purpose of this

research is exploring and implementing highly accurate image processing techniques that are tailored to identify key features from printed images, particularly those of cattle. The previously mentioned traits will be applied to develop a matching algorithm capable of differentiating between individual cattle based on their distinct muzzle features.

### 3.1 Methodology

Our approach integrates experimental data collection, image enhancement methods, image processing techniques, feature detection and estimation algorithms to effectively accomplish the research objectives. In the **data collection phase**, a diverse dataset of cattle muzzle images was acquired, trying to collect a broad range of different breeds and distinct patterns displayed in their muzzles. Because only a small portion of this data set was feasible, a new step was needed to gather some extra samples. In order to accomplish this, 2 farms were approached by us and we managed to take pictures of 50 more bovines. In order to improve the quality of the images, we relied on different preprocessing techniques. The **image pre-processing techniques** employed in this study involved resizing, noise reduction, and normalization. These techniques were found to be effective in enhancing the consistency and clarity of the images, thereby facilitating their analysis. The images then were subjected to **image processing techniques** in order to extract relevant information from them. To accomplish this task, several operators for edge detection were tried as well as trying algorithms such as principal component analysis (Mudrova and Procházka, 2005), contour drawing, top-hat filtering (Zeng and Peng, 2006) etc. in order to isolate and examine the muzzle region in particular. The process of correlation between the reference image from the database and the input image is done by applying Scale Invariant Feature Transform (Lindeberg, 2012) (SIFT) feature detection with Lowe's ratio (Lowe, 2004) and filtering the results with the help of Random Sample Consensus (Fischler and Bolles, 1981) (RANSAC). The methodology seeks to achieve precise and dependable identification of cattle by incorporating various components and utilizing their distinctive muzzle prints. In the upcoming chapters, we will thoroughly examine each component of the methodology (Figure 1), present the results that were obtained, and conduct a comprehensive analysis of the findings.



Source: Computed by authors

**Figure 1. Methodology**

### 3.2 Alignment

In order to establish a system based on muzzle print correlation, it is mandatory to have a corresponding reference image for each animal. To achieve this objective, a QR code can be attached or can replace the ear tag. This code should contain all the pertinent details, including the farm identification code, breed, date of birth, ear tag or microchip number, and the database index for the corresponding reference image (Figure 2).

The **alignment** of the input image with the reference image is a critical step in the proposed methodology, as even a slight rotation can result in the extraction of a completely different muzzle print. This is particularly important due to the wide range of color variations observed in cattle muzzles, making it challenging to extract accurate prints without proper alignment. Ensuring precise alignment helps maintain the consistency and reliability of the subsequent analysis and processing steps. To achieve alignment, a series of steps must be chained.

- *Grayscale conversion*: The process of grayscale conversion is necessary to reduce the complexity of the image. By doing this, subsequent processing steps are simplified.
- *SIFT feature detection*: Detecting distinctive key points in grayscale images involves using the SIFT algorithm. The SIFT algorithm is capable of detecting key locations that remain constant despite changes in scale, rotation, and other affine transformations. This property makes them highly appropriate for tasks that require image alignment.
- *Brute-force matching* (Jakubović and Velagić, 2018): The brute-force matching technique is applied to identify correspondences between the key points that have been detected in both images. The process involves a comparison of the characteristics of every key point in one image with those of all the key points in the other image. This is done to establish similarities and differences between the two images.
- *Filtering by Lowe's ratio test*: In order to ensure precise matches, the Lowe's ratio test has been used to eliminate any ambiguous matches. The purpose of this test is to evaluate the distances between the best and the second-most ideal matches for every key point. If the ratio of matches exceeds a certain threshold, they are eliminated.
- *Transformation Matrix using RANSAC*: For aligning key points between two images, an estimation of the transformation matrix is required. This is achieved by using the Random Sample Consensus (RANSAC) algorithm. The RANSAC algorithm follows an iterative approach to identify a subset of matches and estimate a transformation matrix based on these matches. This process involves the removal of anomalies to ensure the accuracy of the transformation matrix. By applying RANSAC, the precision of the alignment is guaranteed.

- *Crop*: After achieving alignment, the next step is to crop the aligned images to eliminate any unwanted noise regions. This process results in the desired alignment outcome.

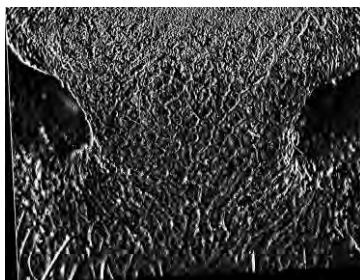


Source: Computed by authors

**Figure 2. Reference image (left), input image (middle), aligned after reference image (right)**

### 3.3 Edge detection

Edge detection plays a vital role in the proposed methodology for identifying cattle based on their muzzle prints. By detecting and highlighting the edges of the muzzle region, it becomes easier to extract the distinct features and patterns that characterize the prints. The Sobel operators (Kanopoulos, Vasanthavada and Baker, 1988) are frequently employed in this context for edge detection. To calculate the gradients in the image, the Sobel X operator was extensively used due to the ridges of the muzzle having a tendency to align more horizontally rather than vertically. While the Sobel Y operator places more emphasis on vertical intensity variations, the Sobel X operator concentrates on recording changes in intensity in the horizontal direction. This is another vital phase in the process of extracting the main features of the muzzle, because this allows to accentuate all the main important features of the muzzle and emphasizes the overall muzzle print (Figure 3).



Source: Computed by authors

**Figure 3. Aligned image after applying edge detection**

### 3.4 Image enhancement

In order to precisely identify the distinct features of the muzzle print, we will use noise removal techniques. The main aim is to clearly create a delimitation between the ridges and valleys of the muzzle, removing unwanted variations or distortions caused by noise. Our objective is to enhance the unique characteristics present in the muzzle print by reducing random variations and distortions. To effectively remove noise from the image, we have opted to employ the technique of median filtering (Astola, Haavisto and Neuvo, 1990) due to the characteristics of the output obtained from the edge detection phase. The edge detection result would often include a large number of isolated pixels close to important ridge areas and in these cases, median filtering proves to be the optimal choice for noise removal by effectively eliminating noise while preserving the essential details of the ridge structure (Figure 4).



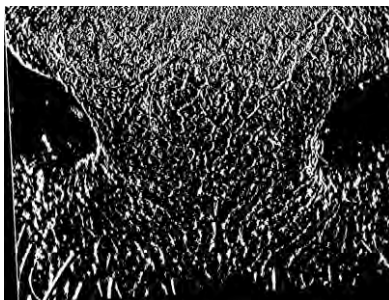
Source: Computed by authors

**Figure 4. Processed image after removing noise**

### 3.5 Binarization

In order to acquire the best representation of muzzle features and allow our correlation algorithm to distinguish between several muzzle prints, binarization is the essential last stage in image processing (Figure 5). Since the input images have uneven lighting and varying levels of contrast, we have opted to use the Otsu binarization (Otsu, 1979), which automatically determines the threshold. This way, the muzzle prints become recognizable, and it makes it easier for the correlation method to accurately differentiate them by converting the image into a binary form, with pixels designated as either black or white based on a determined threshold. The majority of the characteristics were extracted in this final processing step. Due to the substantial amount of preprocessing needed, it is obvious that this method results in the loss of subtle features, but it also depends on the environment in which the image was taken, such as angle, clarity, brightness, contrast, image obstructions etc.





Source: Computed by authors

**Figure 5. Processed image after applying binarization**

### **3.6 Image correlation**

In most of the relevant academic literature, machine learning models, particularly SVM models, have been frequently used for print matching. Nevertheless, due to the major constraint in the dataset at our disposal, we have opted to investigate an alternative methodology that does not rely on a learned or supervised approach. In the context of the discussed approach, several steps are employed in order to reach our objectives. Our methodology involves utilizing the SIFT algorithm in combination with the Random Sample Consensus (RANSAC) algorithm (Figure 6).

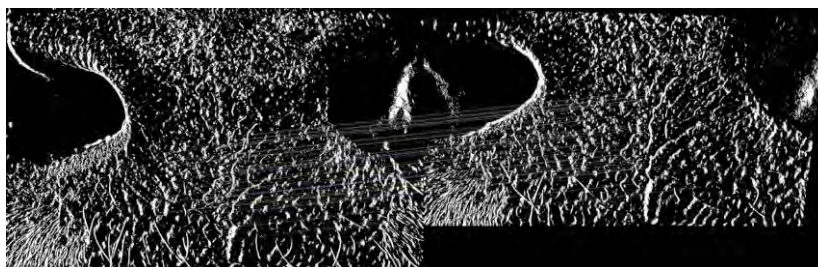
These methods are widely recognized for their ability to provide reliable and efficient evaluation of image similarity, without requiring the use of explicit machine learning models. In the beginning, the SIFT algorithm is applied, which means finding unique key points and extracting their corresponding descriptors for every image. This step enables the representation of image regions in a scale-invariant and rotation-invariant manner.

A brute-force matcher is used to find correspondences between the key points in the two photos. Then, Lowe's ratio test is performed to choose the most reliable matches while discarding ambiguous ones. Matches with a sufficiently large ratio are eliminated by taking into account the distance ratios between the best and second-best matches. By using the RANSAC algorithm, the matches are further refined.

By developing a transformation model that best aligns the key points between the two images, RANSAC seeks to filter out misfits. A transformation is computed, and a consensus set of inliers is found by repeatedly choosing a random subset of matches. To select the best matches that meet the stated maximum reprojection error requirement, this process is repeated. The resulting filtered matches are then used to determine the similarity score. The number of RANSAC-filtered matches is evaluated to determine the similarity method.

According to the results, a custom threshold can be chosen since there are enough matches between the input image and the animal corresponding to that

muzzle print in the database. If the input image does not meet the predetermined threshold, the cattle are not yet included in the database of muzzle prints. The related animal is indicated by the greatest number of matches. Our proposed method attempts to evaluate the similarity of pictures using the SIFT technique, key point matching, and the RANSAC algorithm in the absence of machine learning models. This approach choice addresses the constraint imposed by the lack of a suitable training dataset and offers a trustworthy approach to assessing image similarity.



Source: Computed by authors

**Figure 6. Feature correlations**

### **3.7 Limitations of the study**

There is a lack of extensive, diverse datasets that are specifically centered on cattle muzzle prints. We have obtained a dataset from another research (Xiong, Li and Erickson, 2022), which is of moderate size and it includes muzzle prints from more than 250 individual cattle, with approximately six images per animal. Unfortunately, there are several different resolutions, in which numerous images are of such small dimensions that the ridges and valleys of the muzzle cannot be extracted. On top of that, a lot more images, apart from those of low resolution, are not of great quality. Considering that only a small fraction of these images was considered usable, we have taken the initiative to include additional samples that were obtained from two more farms. Nevertheless, it is important to acknowledge that there may be limitations in our study regarding the representation of various cattle breeds and their respective muzzle characteristics.

While conducting this work, we became aware of environmental factors that can lead to lower or greater precision in identifying muzzle prints, such as light and the quality of images. Although suitable techniques for image preprocessing are applied to minimize these effects, it must be understood that uncontrollable environmental factors may still impose certain limitations. In order to achieve the best results, it is preferred that the images sent as input are close enough to the animal, allowing for the distinct characteristics of their

muzzle to be perfectly visible. Additionally, it is mandatory that the capture be obtained from a comparable angle to that of the reference image.

#### **4. RESULTS AND ANALYSIS**

The findings and analysis from our thesis on identifying cattle muzzle prints are presented in this chapter. The suggested methodology shows that it can successfully distinguish between various cattle based on their muzzle features. The important conclusions from our experiments are highlighted in the next points:

- *Distinction between individual cattle:* Using each individual cattle's distinctive muzzle print, our method successfully distinguishes one cattle from another. We found through extensive testing that the system regularly and correctly associates animal muzzle prints with their associated animals.
- *High matching numbers for the same animal muzzles:* We found that the matching numbers between different captures of the same animal can lead to as many as 200 matches during our tests. This result highlights the accuracy and dependability of our algorithms in matching muzzle prints to the appropriate animals.
- *Setting a threshold for database inclusion:* We recommend taking into account at least 40 matches when establishing a threshold for assessing if an animal is in the database. This advice is based on our thorough investigation, which showed that even the lowest matching score for the same animal across many images was 44 matches overall.
- *Matches for different cattle individuals:* Our research revealed a maximum of 37 matches in terms of discerning between distinct cattle individuals. This result shows that the system successfully distinguishes between calves with distinct muzzle prints, ensuring accurate identification even when working with animals with varying features.
- *Experimental setup:* We used a sample size of 30 cattle for our tests. We were able to thoroughly evaluate how well our system worked because every animal had two to four different photographs representing it. Bovines from both the extracted dataset and the ones photographed from nearby farms were included in the testing phase, ensuring its diversity and depth.

##### **4.1 Presentation of the dataset**

In this section, we present the dataset used in our cattle muzzle print identification study. The dataset consists of both pictures that were taken by our team and pictures that were received from a third-party source. Our goal is to give a summary of the dataset and talk about the image quality. We will highlight noteworthy photos, discuss their relevance, and analyze images that are considered of lower quality. We hope to lay a foundation for the subsequent analysis of our methods through this exploration. As mentioned in the previous chapters, the main images used in our research come from the research paper

(Li, Erickson and Xiong, 2022). The provided images are of high quality, with the muzzle print being clearly visible without any obstructions. These images fit the criteria for an ideal representation for our analysis, making it a good example of an input. The presence of noise as well as the image's low resolution, which makes it challenging to extract the muzzle's specifics correctly, are both obstacles. In particular, there are overlapping items that make it difficult to clearly see the muzzle print. These elements collectively contribute to lowering the image's quality and suitability for precise analysis.

Undertaking the endeavor of building our own collection of muzzle photos proved to be a challenging task. Cattle posed challenges throughout the process due to their tendency to move and reluctance to face the camera. Despite these challenges, we were able to obtain a number of samples, a couple being displayed below. These photos (Figure 7) demonstrate our sincere attempts to collect a varied and thorough collection of cow muzzle prints, highlighting the distinctive traits of the animals included in our study.



Source: Computed by authors

**Figure 7. High quality muzzle example from own dataset**

## **5. CONCLUSIONS**

The objective of this paper was to investigate the feasibility of recognizing cattle through their muzzle characteristics. The methodology proposed for this study comprises a set of image processing techniques. These techniques involve aligning the input image to a reference image, applying edge detection, noise removal, blurring, Otsu binarization, and correlating the output to the corresponding image. The findings gathered through this methodology have shown great potential, emphasizing the practicality of making use of muzzle characteristics as a dependable method for identifying cattle.

For the future, there are several areas for exploration that can lead to the improvement of the methodology. A more precise and accurate representation of the key features of cattle muzzle images can be achieved by selecting or developing an operator that is specifically tailored to cattle muzzle characteristics while efficiently removing supplementary noise. This requires careful consideration and attention to detail. Furthermore, conducting a more in-depth analysis of the alignment process may yield advantageous results. At

present, the process of alignment is centered on reducing discrepancies in the placement and direction of images in order to aid in the processing of the images that follow. It is possible to develop a task-specific alignment approach that can handle greater variations in rotations. By utilizing rotational alignment techniques that are customized to the unique features of cattle muzzle images, subsequent image processing steps can be executed with enhanced accuracy.

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## INVESTIGATING STUDENTS' PERSPECTIVE ON E-LEARNING- A QUALITATIVE APPROACH

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### **Abstract**

*The online learning trend started long before the Covid 19 pandemic. As a result of two years of strict online learning, education is nowadays seen differently, letting the door opened for researchers to investigate the advantages and disadvantages of this type of learning and its impact upon professional output for university students. The purpose of this research is to investigate students' opinion regarding the online learning process. The objectives are: (1) to identify the perceived advantages of online learning; (2) to identify the perceived disadvantages of online learning; (3) to explore the role of online learning in students' professional life. In order to collect data, the in-depth interview qualitative method was used, based on the interview guide. The sample included 40 students with at least one year experience in online learning. Results reveal that the advantages of online learning are: flexibility, comfort, resources saving, improving professional skills, more access to information, responsibility and improving personal life while the disadvantages are social interaction issues, health problems, lower involvement, communication issues, technical problems, problems related to understanding information, online addiction and some evaluation problems.*

**Keywords:** online learning, Covid-19, advantages of online learning, disadvantages of online learning

**JEL Classification:** M31; M39.



## 1. INTRODUCTION

The online learning trend started long before the Covid 19 pandemic (Karsenti, 2013, Terras and Ramsay, 2015; Pina and Steffens, 2015), due to its benefits such as low-cost or even free contents and / or easy access (Castillo *et al.*, 2015).

Researchers usually refer to online learning as MOOC, an acronym for massive open online course. The online learning increase, which is both an evolution and a fad on Karsenti (2013) opinion, was also approached in the literature (Al-Rahmi *et al.*, 2018; 2019, Gomez *et al.*, 2022, Pina and Steffens, 2015). Yet, the Covid 19 pandemic transformed the trend in regulation, given the distancing restrictions specified by governments in various countries (Purkayastha and Sinha, 2021; Hesen *et al.*, 2022; Bloomfield *et al.*, 2022; Thao *et al.*, 2023).

As a result of two years of strict online learning, education is nowadays seen differently (Gomez *et al.*, 2022; Deeva, 2022; Hesen *et al.*, 2022). This aspect gave researchers the opportunity to study the advantages and disadvantages of online learning, comparing to traditional, face to face learning, and its impact upon professional output for university students.

It is important to understand whether online learning is a positive movement, given the enlarged number of learning opportunities (Gomez *et al.*, 2022). Also, it is important to understand that the learning process is different for specific learning subjects. For example, researchers' interest in learning issues also investigated specific learning areas and specific learning methods that increase efficiency. Such an example is Alm *et al.* (2022) study, presenting how students may be motivated to learn on sustainability in higher education institutions. The results of Alm *et al.* (2022) study highlights that, at least for sustainability learning, involving students in projects and real-life experiences is a key factor to understand and integrate the concept in students' present and future life. In line with this idea, Hesen *et al.* (2022) highlight that other learning forms, such as arts, embodied or place-based type of learning may be not a well match with online learning.

Thus, online learning may be an impediment for teaching certain concepts that need more understanding than traditional information delivery.

This paper addresses the online learning debate, from the perspective of advantages and disadvantages of this type of learning.

The purpose of this research is to investigate students' opinion regarding the online learning process.

The objectives are: (1) to identify the perceived advantages of online learning; (2) to identify the perceived disadvantages of online learning; (3) to explore the role of online learning in students' professional life.

## 2. LITERATURE REVIEW

In Karsenti (2013) review of the history and issues of MOOC (massive open online course) in university education, we find out that the previous form of distance learning started in 1873, in Boston, when women had the opportunity to study at home based on correspondence instructions sent by mail. Officially, the first correspondence college was College of Liberal Arts in New York State, leading to what is now MOOC (massive open online course): a form of distance learning with the improve of extra video lessons and the appearance of the professor in the video multimedia presentation (Karsenti, 2013), creating an online video – education relationship (Pantò and Comas-Quinn, 2013).

The most important advantage of online learning is, by far, the comfort ability of the learner. The students may be at home or any other place and also be part of the learning process (“learning from any place, at any time”, Karsenti, 2013, p. 34), as courses are easy to access having the web access (Yeager, Hurley-Dasgupta, and Bliss, 2013). As such, this leads to another important advantage, as suggested by Karsenti (2013), of being innovative and revolutionary. Yeager, Hurley-Dasgupta, and Bliss (2013) consider that this type of learning helps on the twenty-first century necessary skills and literacy. Also, from the institution perspective, online learning gives the opportunity for large number of students to be present at the same time.

Another advantage is the possibility for large number of students to “meet” on specific online communication platforms in order to create their own learning community (Yeager, Hurley-Dasgupta, and Bliss, 2013; Wei, Saab and Admiraal, 2023), creating a “classroom-like atmosphere” (Karsenti, 2013, p. 29).

Yet, maybe the most important advantages of online learning, seen from a distant perspective, is the easy access to knowledge (Karsenti, 2013) and the passing to the process of free education (Karsenti, 2013; Pantò and Comas-Quinn, 2013).

It is important to understand that online learning requires for some specific skills, including motivation for this type of learning, digital literacy and self-regulation (Terras and Ramsay, 2015; Pina and Steffens, 2015; Pantò and Comas-Quinn, 2013; Wei, Saab and Admiraal, 2023). This leads to an important disadvantage from the institutional perspective, specifically learners high drop-out rate (Wei, Saab and Admiraal, 2023; Heslen, Wals and Tauritz, 2022), as only 10% average students finish all parts of their course (Liyanagunawardena *et al.*, 2014; Pina and Steffens, 2015). High dropouts are also a result of online information overload (Gomez *et al.*, 2022; Zhang *et al.*, 2018; Gütl *et al.* 2014) when it comes to choose a course that fits their preferences and be balanced for their needs. Gütl *et al.* (2014) conducted survey-based research of 134 students to identify the reasons why students give up finishing an online course. Their study identified that there may be various personal or academic reasons, such as

not having enough time, changes in their jobs, the course is either too difficult or not challenging enough.

Karsenti (2013) and Pantò and Comas-Quinn (2013) reviews debates upon other important issues and / or disadvantage of the online learning form, as stated by the literature. Such issues are the concern for being able to teach a large number of students at once, having only the online connection and not having a proper teacher-student interaction, aspect that convinced the author to call this phenomenon a “a huge knowledge marketplace” (Karsenti, 2013, p. 28). Also, as Karsenti (2013) observes, online learning offers interesting tools, that replace the chalk, the marker, the table or the teacher, that prove to be useless, as learners either don’t need or don’t know how to use.

As online learning involves large number of students, assessment of learners is done automatically, machine-based, leading to impossible individual feedback (Karsenti 2013). This leads to another important disadvantage of online learning.

Higher education institution cannot approach learning, may it be traditional or online learning, outside the University Social Responsibility, defined by Vasilescu *et al.* (2010), as “the need to strengthen civic commitment and active citizenship” (p. 4178) including actions such as volunteering, promoting ecological, environmental commitment, ethical approach (Vasilescu *et al.*, 2010). But, as highlighted above, certain complex concepts such as sustainability may be difficult or even impossible to integrate in daily life with distancing and online learning. Academic integrity actions, such as plagiarism or verifying the real identity of the person registered as a student are major issues in online learning systems (Gomez *et al.*, 2022).

As such, compared to online learning, an important advantage of face to face, traditional learning is the interaction with people associated with the teaching environment, such as teachers, peers and tutors and with learning objects are fostering the self-regulation learning (Pina and Steffens, 2015). Yet, the Covid 19 pandemic was an opportunity to prove that online learning can facilitate the sense of community, based on the efforts of educators and students within creative tasks such as both parts creating a safe environment and “fostering subjectification” (Hesen, Wals and Tauritz, 2022, p. 101).

Debating on the impact of online learning upon students’ preparation for their future career, Wei, Saab and Admiraal (2023) concluded that “being engaged in a MOOC is essential to understand knowledge and master skills” (p. 2).

### **3. METHOD**

The purpose of this research is to investigate students’ opinion regarding the online learning process.

The objectives are: (1) to identify the perceived advantages of online learning; (2) to identify the perceived disadvantages of online learning; (3) to explore the role of online learning in students' professional life.

In order to collect data, the in-depth interview qualitative method was used, based on the interview guide.

The sample included 40 master students (26 women and 14 men) with at least one year experience in online learning.

The interview guide used with open-ended questions and included projective techniques, especially the collages. The students were asked, during the interview, to select 3-4 images that better express their thoughts and feelings about online learning experience.

The main topics addressed with the interview guide are: general thoughts and feelings about online learning, advantages and disadvantages of online learning, online learning and professional aspects, image descriptions and the collages. The content analysis was used and categories and codes were identified.

#### 4. RESULTS

The first objective of the research is **to identify the perceived advantages of online learning**. The answers of the respondents were processed and the results (presented in Table 1) were completed by the images' analysis.

**Table 1. Advantages of online learning**

Categories	Sub-categories (codes)	Frequency
<b>Flexibility (86 mentions)</b>	Location	18
	-connect from anywhere	18
	Multi-tasking	49
	-online learning during a trip	6
	- online learning during job schedule	22
	-doing more things in the same time	21
	Time management	19
	-easier to organize the schedule	10
	-more freedom	9
<b>Comfort (75 mentions)</b>	Place	25
	- listen to the courses from the comfort of the house	17
	-stay comfortable, as you like	8
	Outfit	14
	-casual, even pajama	11
	-less attention to makeup	3

Categories	Sub-categories (codes)	Frequency
	Facilities	17
	-prepare/drink a coffee	9
	-eat	8
	More relaxing, less stress	19
<b>Resources saving (36 mentions)</b>	Time (not going to school, preparing for school, printing the projects)	21
	Money (rent, transport)	12
	Other resources (printed paper, offline books)	3
<b>Improving professional skills (30 mentions)</b>	Critical thinking	2
	Fast adaptability to something new	8
	Technical skills	20
	-experience in using more platforms/programs	10
	-online presentations skills	6
	-skills for an online job	4
<b>Access to information (26 mentions)</b>	Easier access	12
	Faster access	10
	More interactive information	4
<b>Responsibility (20 mentions)</b>	More responsible	10
	Individual working abilities	4
	More efforts to stand up/be noticed	3
	Self-discipline	3
<b>Personal life (20 mentions)</b>	More time for personal life	12
	-for a hobby	5
	-for the family	7
	More time to think	4
	Self-awareness/self- knowledge	4

Source: research data

The most important advantage of e-learning is the flexibility of this process (with 86 mentions). In this category, we identified three sub-categories, related to the location, the opportunity of multi-tasking and better time management. Most of the participants mention more than one the advantage of multi-tasking (focusing on the opportunity to do more things in the same time: travelling, working on their job or eating) while for almost half of the respondents it is important that they can access the classes from anywhere (“I appreciate the ability to attend classes regardless of location, it doesn't matter where you are, it's important to have an internet connection and pay attention to classes, which I think is extremely convenient for all students”) and the possibility to better organize their time (“It is easier to organize my schedule”).

The next important advantage for the students who studied in the online environment is the comfort they experienced. The main source of the comfort is the place they stay in while listening the classes, in their house (“If one day I

want to be more comfortable, I can sit quietly in bed, but at the same time I can also pay attention to classes”, “I’m glad that when I’m having a day when I’m feeling down or low on energy, I can sit in bed and listen to the class, comparing to the traditional situation where it might have been difficult for me to come to school”). During the interviews, 75 mentions referred to this advantage. Their outfit can be casual and, during a class, they can prepare and drink a coffee or even eat (“Another advantage that I see is the fact that I can have a small snack during the classes, without disturbing anyone, I save time”, “when online class doesn’t require us to open the web camera, I totally relax in my pajamas”). These facilities make them feel relaxed and less stressed, compared with the traditional learning (“I am no longer afraid to respond to the debates we have on each topic”).

Online learning facilitates are related also to resources savings (36 mentions), the students referring mostly to time and money. For 21 participants, saving time is an opportunity when they study in the online environment (“I save time instead of traveling to school or finding the location where classes are held”, “I no longer waste 30-60 min in traffic going and 30-60 min coming back from college, that is, it saves me at least an hour of sitting without doing anything productive”) mostly because they can invest more in doing other activities (“in the remaining time I also do various activities that help me to develop my skills”). Almost half of the respondents appreciate not going to school because this allows them to save money with transport or printing their projects (“I don’t spent money for gas or transport tickets”).

The category improving professional skills was identified in 30 students’ mentions. Half of the students appreciate that they can improve the technical skills, very useful for a potential online job (gaining experience in using more programs and platforms, such as Teams, Zoom, Moodle or Google meet or improving their online presentation skills): “improving technological skills, which is extremely important at the professional level”, “I didn’t know about these applications until I switched to the online environment”. Only 8 participants highlighted the opportunity to quickly adapt to a new context or new information but also to develop their critical thinking ability: “the practice of verifying information using several sources, which will later develop the ability to think critically and independently solve a problem”.

Another important advantage of e-learning is the access to online information (26 mentions). Students appreciate the easier (12 out of 40 answers) and the faster access (10 out of 40 answers) to online information: “The information is on different platforms, there is more online available information and I search for online information while the teacher is talking”, “availability of learning materials in a very short time”, „the didactic materials are distributed quickly, being available for all students to access as soon as they were posted, which streamlines the process of learning and going through the materials”, „the

information remains in the online environment, so I can access it when I want". Also, a few respondents consider the information to be more interactive in the online environment, compared to the traditional learning: „the lesson is more interactive, for example, we can access a site/program given by the teacher and understand the course better", „online learning has a number of tools such as presentations, videos, PDFs, podcasts and teachers can use all these tools as part of their lesson plans. By expanding the lesson plan beyond traditional textbooks to include online resources, teachers can become more effective educators".

Studying online helped students becoming more responsible (20 mentions), developing their individual working abilities and making more efforts to stand up during the class, in the context of lower interactivity with the colleagues and the teachers: "I learned to solve a problem autonomously", "It was like a self-discipline that I hardly accepted", "You must concentrate on what is being taught, pay attention to information and take notes".

The time saving generates another relevant advantage of online learning, improving personal life (20 mentions). Less time for going to school and staying in traffic means more time for personal activities (hobbies and family) and for meditating to different issues: "I had to get to learn to organize my mind and priorities, figure out what I like or what I don't like", "I had the opportunity to spend more time among my thoughts, to put them in order", "The online environment gives me more free time to focus on my hobbies, more precisely cooking", "more time for loved ones".

The second objective of the research is **to identify the perceived disadvantages of online learning**. The main categories were identified and described. The results of the content analysis are presented in Table 2.

**Table 2. Disadvantages of online learning**

Categories	Sub-categories (codes)	Frequency
<b>Social interaction issues (85 mentions)</b>	Lower quality interaction	66
	-no face to face interaction with colleagues	37
	-no face to face interaction with professors	19
	-less team work	10
	Loosing student life experience	19
<b>Health problems (75 mentions)</b>	Emotional problems	34
	-intellectual fatigue	7
	-feeling of isolation	9
	-burn out	5
	-anxiety	13
	Physical problems	41
	-back problems	10
	-eyes problems	13

Categories	Sub-categories (codes)	Frequency
	-physical fatigue	14
	-headache	4
<b>Lower involvement (59 mentions)</b>	Less attention on the classes	37
	-difficulty to focus	17
	-lack of visual contact	5
	-less responsibility	3
	-boredom	10
	-easiness to refuse to answer	2
	More distractions	12
	-other activities	10
	-more people in the house, making noise	2
	Lack of motivation for study	10
<b>Communication issues (56 mentions)</b>	No face to face communication in classes	25
	No real connection	17
	Loosing communication skills	9
	No/less feedback for homework	2
	More students speaking in the same time	2
	Easier to ignore an online message	1
<b>Technical problems (43 mentions)</b>	No Internet/ Weak WIFI connection	27
	Laptop problems	12
	Problems with the webcam/ the microphone	4
<b>Problems related to understanding information (21 mentions)</b>	Difficult to understand the lesson	16
	Less practical work (the business cases were less discussed)	4
	Teachers less prepared for online lessons	1
<b>Online addiction (16 mentions)</b>	Encourage online information addiction	8
	Information access easier and faster	2
	Less desire to socialize	6
<b>Evaluation problems (7 mentions)</b>	Lack of time to better know the students	1
	Less time for students to stand out	3
	Easier to cheat at the exams	3

Source: research data

The most important disadvantage of online learning is related with the social interaction issues (85 mentions). The lack of face to face interaction with the colleagues and the teachers and also less team work activities led to lower quality interactions, in general (66 mentions): “Interaction with colleagues and teachers would bring me more ideas and experience exchanges because it is well known that relationships between people decisively determine the quality of our lives more than any other factor”, “teamwork is less efficient and harder to achieve”, “we are somehow closed in our own house, alone, without making contact with colleagues”. Also, half of the participants talked about the student’



life experience that dramatically has changed in the online environment. They feel this is a huge loss for them: “when we are in class, we feel that we are students, that with the passing of the years we remember the funniest events that happened in the classroom”, “my college years are wasted and my studentship loses its value”.

All the students mention at least one health problem caused by online learning in the pandemic context (75 mentions). In this category, we identified two sub-categories: emotional (34 mentions) and physical problems (41 mentions). All the students complained about at least one physical health problem: physical fatigue (14 mentions), eyes (13 mentions) and back problems (10 mentions) or headaches (4 mentions): “because of the long working hours, problems began to appear both psychologically (depression, anxiety) and physically (headaches, eyes problems, backaches)”, “due to the excessive exposure to the computer, I started to have more problems with migraines and my eyes, which affects my mood a lot”. The most frequent emotional issues are: the anxiety (13 mentions), the feeling of isolation (9 mentions), the intellectual fatigue (7 mentions) and burn out (5 mentions). Spending a lot of time alone, in front of the computer, without the physical presence of their colleagues, the students experienced a lot of emotional challenges (“I found it very difficult to face so many problems by myself, a lot of stress and fatigue comes into play”, “Online learning practically isolates you from the rest of the world, deprives you of many activities, which you can do when you study face to face”), that impacted the quality of their social life (“online learning made me more anti-social and introverted, which sometimes gave me trouble when trying to meet other people”).

An important disadvantage of online learning is the lower involvement of the students in the educational process. Three main factors influence this behavior: the lack of attention on the classes (37 mentions), the existence of more distractions sources (12 mentions) and a lower motivation for study, in general (10 mentions). The students also explain the causes that led to the decrease in the level of attention, in the online study compared to the face-to-face one: the difficulty to focus on the information (“online learning decreases concentration”, “therefore, it is imperative that teachers keep their online courses clear, engaging and interactive to help students stay focused on the lesson”), the lack of visual contact (“my participation is more passive, probably influenced by the lack of eye contact”), the boredom (“I don't always listen to the classes with great interest and I get bored quite quickly”) and even the easiness to refuse the involvement (“You can leave the course, leave the computer or use the excuse that the microphone/web camera doesn't work ”). The lack of involvement is caused also by the distractions (other activities, Social Media, people in the house) (12 mentions) that are more present in the online environment: “sometimes we get distracted by other things and maybe don't absorb as much

information and knowledge”, “a greater possibility of students being easily distracted by social media or other sites”. In this context, the motivation to study in lower (10 mentions): “online learning is so flexible, sometimes I lose my motivation to work on the classes”.

Communication issues are a reason why students disliked online learning (56 mentions). The biggest dissatisfaction is the lack of face to face communication during the classes, the more so as many students attended the classes without the webcam (“lack of real communication changes our behavior, human relationships”). In this context, they missed the real connection between them and their colleagues or their teachers (17 mentions). A participant suggestively described this disadvantage, saying: “I often feel alone in front of a device, trying to keep up with teaching”. A significant consequence is that the students feel their communication skills are negatively influenced (9 mentions): “when people meet they no longer know how to communicate”. Also, the offering a feedback became difficult in the online environment (“It is simply not possible for a teacher to provide specific and prompt feedback”).

Studying in the online environment, students faced a lot of technical problems (43 mentions), the most common (27 mentions) being related to the Internet access (“I feel frustrated because of technical problems, especially when the Internet does not work”). Also, devices problems (laptop, webcam or microphone) were challenges for the respondents.

Strongly connected with communication issues, problems related to understanding information (21 mentions) represented a challenge for the students during the online classes. More specific, the respondents discussed about the difficulty to understand the lessons (16 mentions) and to work on practical case studies (“in some cases, we faced a difficulty to process the materials, which, in face to face classes, were easier to understand and go through”, “information is not clear every time, and teachers cannot be aware of this”).

Online addiction was an important disadvantage of the e-learning (16 mentions). Some students were aware that “the lack of real communication changes their behavior, the human relationships and leads to the "atrophy of their senses", becoming robots that have something to do and they do it”. This problem has long-term effects, leading to the low need to socialize: “because of online learning I think many have become more antisocial and would now prefer a remote job”.

The last issue identified in our study refers to some evaluation problems mentioned by a few participants. On one hand, teachers don’t have enough time to better know the students and to make an objective evaluation. On the other hand, students don’t have the proper context to stand out and sometimes, cheating at the exams is easier compared with the face-to-face classes.

The third objective of the research is **to explore the role of online learning in students' professional life.**

Two main direction were identified regarding the contribution of online learning on the professional life of the participants:

*a. Work and study opportunities (20 mentions)*

The students were excited by the possibility to keep their job while their study at the faculty. Some of them even said that they would quit school without the opportunity to study online.

More than that, e-learning offers the context where students can focus more on their job, advancing on their business positions, with the possibility to be promoted and still studying classes: “with the help of the online school I was able to focus on the professional side as well, managing to get promoted 2 times in the same year in a company where I enjoy working”. Improving the balance between school and work is a satisfying reason for students and an important advantage of e-learning: “the balance I managed to achieve, being able to work full-time at work, but at the same time managing to attend classes... this balance has helped me not to give up and move on”.

*b. Improve professional skills (30 mentions)*

Regarding the role of online learning in their professional life, the students appreciated new acquired or improved skills that will help them in the future. The main skills are: critical thinking, fast adaptability to something new and technical skills. The online learning helped students to be oriented more towards critical thinking, to analyze more the available information, to manage to highlight the essential. Flexibility and adaptability are skills with an important impact on their professional development: “without the online experience we would never have thought that we can adapt so easily and quickly to new conditions and that the actual learning can take place in a different way. If we had only learned face to face we would not have had this flexibility in actions”. Also, using different online platforms allowed students to be better prepared for their jobs, integrating technological skills in their behavior.

Besides the positive perspective on the role of e-learning on students' professional life, most of the participants admit that there were also some aspects that negatively influenced their learning process, such as the lack of attention, focus and persistence.

## **5. CONCLUSIONS**

The purpose of this research was to investigate students' opinion regarding the online learning process, following both positive and negative aspects of this challenge.

The main e-learning advantages identified in the research were: flexibility, comfort (Karsenti, 2013; Yeager *et al.*, 2013), resource-saving, improved professional skills, more access to information (Karsenti, 2013), and

improvement in students' personal lives. The online environment offers a wide range of learning opportunities (Gomez *et al.*, 2022) to develop and improve professional skills like critical thinking and adaptability.

On the other hand, the negative perspective on e-learning in students' lives is brought by disadvantages like: social interaction issues (Pantò and Comas-Quinn, 2013), health problems, lower involvement in classes, communication issues both with colleagues and teachers, technical problems, issues related to understanding information, online addiction, and some evaluation problems.

The research results indicate that online learning is always characterized with opposite words: advantages and disadvantages, opportunity and stress, hard but satisfying, sacrifice and benefits, challenge and comfort zone, comfortable environment but loneliness, good for professional life but bad for social life or, as metaphorical participants described this process, "a double-edged sword", "a maze". Also, the information is faster and easier to access but more difficult to understand. Time is saved by not going to school, but more time is consumed with lessons and homework. A participant says: "For me, online learning is like a mermaid from mythical stories, if initially, it seemed attractive, I realize along the way that it is actually a great challenge". In this context, the students feel there is a need to find a balance between work and personal life. One image included in some participants' collages represents a person walking on a string tied to the ends of two rocks (work and life).

The future research directions involve developing the questionnaire for the quantitative survey, based on the qualitative research, surveying to identify the factors defining the online learning experience, and comparing the online learning experience (bachelor versus master students, on different specializations).

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## A BIBLIOMETRIC ANALYSIS OF PUBLICATION ON PERFORMANCE MANAGEMENT IN PUBLIC INSTITUTIONS

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### **Abstract**

*This article researches the implications of performance management in public institutions. The methodological approach is based on the use of the bibliometric software R-Stata Bibliometrix, specialized in Science Mapping Workflow, to extract meaningful results about the thematic evolution of the performance management in the publication indexed by the Web of Science database. Our search is about “performance management in public institution” and the bibliometric analysis unigram, bigram, and thematic evolutions is about the title and abstract of the articles. The scope of the research is to identify which are the new trends at publication in this field of performance in public administration.*

**Keywords:** *performance, public administration, bibliometrix, qualitative analysis*

**JEL Classification:** H83

### **1. PERFORMANCE MANAGEMENT IN PUBLIC INSTITUTION**

Performance in public administration is one of the main challenges for the management of governmental, national, and local institutions. Performance is the management concept that sets up one mechanism to develop, evaluate, monitor, budget, promote, and celebrate the strategic components of the organization. The benefits of performance management are to increase efficiency and effectiveness in an institution, but at the same time needs to clarify the vision, mission, and strategic direction of the country, county, city, village, etc. Berend van der Kolk, identified three types of performance management in this sector: *target systems*, which measure performance against a standard, *ranking systems*, which measure performance against comparable units, and *intelligence systems*, which measure performance for background information (Berend van der Kolk, 2022). Because public institutions offer in

many cases services for the people and the financial parts have no limit measuring performance is quite a problematic and very relevant issue (Balaboniene and Vecerskiene 2015). Performance is defined as actions of the employees in public institutions: medical treatment, teaching a course, identifying children with drop out, judging in court, solving citizen problems about taxes, planning new streets, etc, or quality of these actions that can be either high or low. (Van Dooren, Bouckaert and Halligan, 2015).

In the public sector, performance measurement was often associated with operational aspects such as the definition of a measurement object, the development/formulation of performance measures, data collection, and data analysis (Castelo and Gomes, 2023). The nature of the public institution has two directions: is about *enabling rather than delivering* because rarely provides final goods and services and a chain of impact including typical horizontal functions such as: financing, human resources management, etc (Van Dooren, De Caluwe and Lonti, 2014).

Initially, many research papers are oriented on identifying the level of satisfaction for the people who are the beneficiaries of the public entities' activities. For this reason, the performance of the public institutions is in correlation with the motivation of the public employees to solve different problems of the citizens. At the same time in the private sector, Kaplan and Norton developed one system Balance Score Card (BSC) to develop and evaluate the results of the business with four perspectives: learning and growing, business process, customer, and financial (Kaplan and Norton, 2008). The main question for the research in this public field is, could find a model or method to adapt the Kaplan and Norton model to the type of institution who have some specific characteristics: not many strategic objectives and abilities in planning, human resources management in many cases with different skills according with jobs description or less rewarded, transparency, accessibility, responsiveness (Van Dooren, De Caluwe and Lonti, 2014). Consider, that the main problem for decision-making is selecting the indicators for evaluating performance because the complexity of the public system depends on budgeting and because costs are more easily measured than benefits efficiency often reduces the economy (Ates, 2001).

## 2. METHODOLOGY

The research presented in this paper is realized based on a search about "*performance in public administration*" in Web of Science Core Collection and dates extracted, 122 publications (articles, conference proceedings, etc.) were analyzed with R-Stata Bibliometrix software. The software offers us the opportunity to identify different aspects in the evolution of the concept between 1997-2024, by generating graphs: i) *co-occurrence network*, has been proposed as an approach to facilitate the understanding and visualization of the structure

of different text items and their content (Puerta *et al.*, 2020). According to Ruiz and Barnett co-occurrence network is a semantic network based on the  $k$  data set is an  $n \times n$  matrix  $S$ , where  $n$  equals the number of nodes in the analysis and  $s_{ij}$  is the measured relationship between the specific nodes  $i$  and  $j$ . The node is the unit of analysis, that represent the most salient words, identified based on cumulative (weighted) frequencies. Links are based on word co-occurrences within a five-word distance. There are a few indicators of a node's position in the network. The Gini coefficient measures the inequality of words within a frequency distribution where a zero score expresses perfect equality and a score of one expresses maximum inequality among the words. Centrality denotes the importance, prominence, or power of a concept in the network (Ruiz and Barnett, 2015). ii) *thematic map* is a method for identifying, analyzing, and reporting patterns (themes) within data, which permit to interpretation of various aspects of the research topics (Braun and Clarck, 2006). According to Callon, Courtial, and Laville (1991), the thematic map is a cluster analysis based on two notions: *centrality*, measures for a given cluster the intensity of its links with other clusters, more numerous and stronger these links, the more this cluster designates a set of research problems considered crucial by the scientific field and *density* characterizes the strength of the links that tie the words making up the cluster together and that density provides a good representation of the cluster's capacity to maintain itself and to develop over the course of time in the field under consideration. The ideas of centrality and density allow us to give a synthetic and simplified presentation of the network's morphology and provide a stepping-stone for dynamic analysis. Since each cluster can be defined by its centrality and density, it is possible to trace what we will call - for reasons that will become obvious - a strategic graph. This graph is obtained by ordering clusters horizontally (along the x-axis) by increasing the order of centrality, and vertically (along the y-axis) by increasing the order of density. This operation allows us to classify all aggregates into four general categories, which correspond to the four quadrants of the graph. This mathematical description of density and centrality help Callon, Courtial, and Laville (1991) to develop the matrix with four quadrants or cluster:

*Quadrants 1 - Clusters of type 1* are both central to the general network (they are strongly connected to other clusters) and have intense internal links (they display a high degree of development). These clusters in some sense constitute the file's core. Their position is strategic, and they are probably dealt with systematically and over a long period by a well-defined group of researchers.

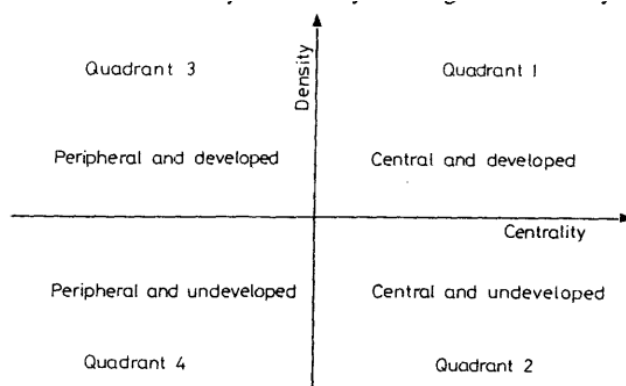
*Quadrants 2 - Clusters of type 2* are central, that is to say, that they are strongly connected to other clusters, but the density of their internal links is relatively low. Such aggregates, although strategic to the file under consideration, might in reality be the object of investments in other, connected, files. They correspond in this case to points of transfer between separate but linked networks. They can



also signal the appearance within a given network of research problems that are becoming central, but which are not yet the object of significant investments: they are becoming mature, and their importance for the field is already indicated by their degree of centrality.

*Quadrants 3 - Clusters of type 3* are not central - we will call them peripheral - and the strength of their internal links leads us to suppose that they correspond to research problems whose study has already been well-developed. They might be clusters that at an earlier time were central, but which - while remaining the object of significant investments (it is not so difficult to explain such permanence) - have been progressively marginalized, generating less and less interest. They appear as specializations that interact weakly with the other sub-networks of the field under study.

*Quadrants 4 - Clusters of type 4* are both peripheral and little developed. They represent the margins of the network. Only a dynamic analysis (the evolution of a network over several periods) or a comparative one (the relationship of the network with other networks) allows us to determine their contribution to the field.



Source: Callon, Courtial and Laville (1991, p.166)

**Figure 1. Strategic diagram and characterization of the clusters in the file**

iii) *thematic evolution* is a spatial representation of relationships between disciplines, fields, and documents or authors.

### 3. RESULTS

Figure 2 shows us the relationship between topics from 1997 – 2024 and could observe the evaluation of concept performance in public administration from administration, performance, and local, measurement (1997- 2010) to factors, organizational, administration, evaluation, study, and impact in 2019-2020. In the last period (2021-2024) the research was oriented to the two relevant directions: public and impact. We can point out that, the topic has many links with each other, and we could identify research topics that have been



centrality values indicate a core location of this node in the network, whereas low betweenness centrality values indicate a more peripheral location (Ma et al., 2016). Closeness centralities indicate the number of steps required to access all other nodes from a given node (Ma et al., 2016) or how close a node is to all other nodes in the set of clusters (Wasserman and Faust, 1994).

**Table 1. Closeness of co-occurrence network, unigram titles**

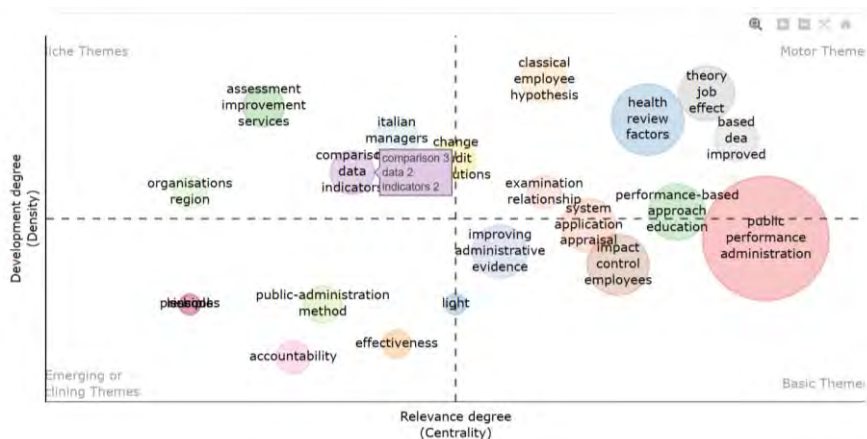
NODE	BETWEENNESS	CLOSENESS
public	373,53	0,02
performance	349,27	0,02
administration	317,89	0,02
management	4,95	0,012
evaluation	0,622	0,011

Source: authors' own processing in R-Stata Bibliometrix

Related to our factor from performance in public administration the closeness is between 0,02 (public, performance, administration) and 0,012 or 0,011 (management and evaluation), that means factor (words) who has the highest value in the context of communication relation, such actors need not rely on other factors for the relaying of information, and they are very productive. The value of betweenness, for the main results (public, performance, administration, management, evaluation) shows us according to Wasserman and Faust that these factors depend on the "other factors" in the set of factors, especially the factors that lie on the paths between the two and they could have potentially might and some control over the interactions between the two nonadjacent factors. The value 373,53 represented that from this node "*public*" passes more than 373, communication links from another factor and could observe in Figure 3 the higher dimension of this node or performance and administration which has approximatively the same values. So, the results in our research presented in Table 1 are "factor in the middle," the one between the others, has some control over paths in the graph.

Thematic analysis of unigram titles, presented in Figure 4, shows us according to the description of decreased, that public performance administration is in quadrant 2, which means this cluster is strongly connected to other clusters, at performance-based education, improve administrative evidence, but the internal density of his internal links is relatively low and this field of research could have resulted in the future but the position in the matrix could be one signal that this cluster became mature and the importance in the field decrease indicated by his centrality value. Motor themes situated in

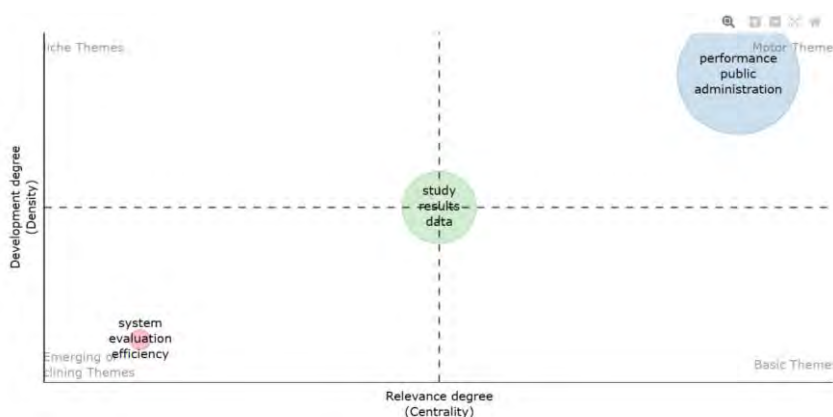
quadrant 1 are: the health review factor, and theory job effect, which are dealt with systematically and for a long period by the researcher.



Source authors' own processing in R-Stata Bibliometrix

**Figure 4 Thematic map, unigram titles**

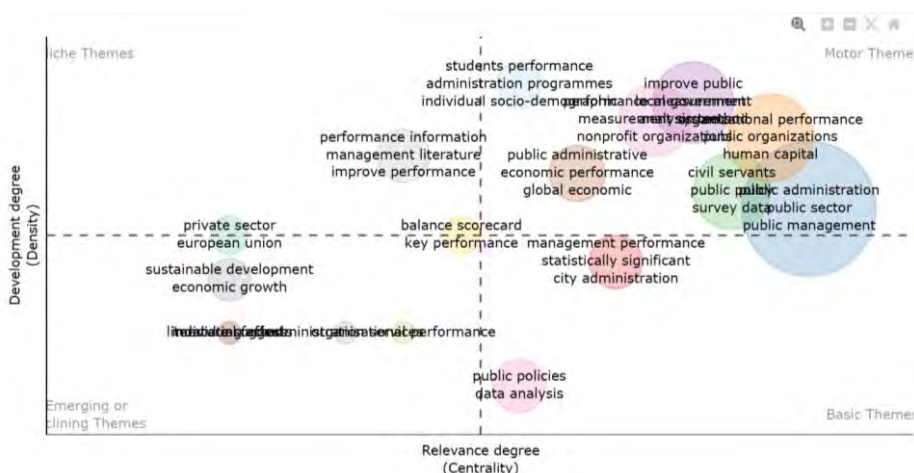
Thematic analysis of unigram abstracts, presented in Figure 5, is interesting because you can observe that performance management in public administration has a few motor themes such as *performance*, *public*, and *administration*, some medium directions at *study*, *results*, and *data* but these words have zero relevance for our analysis. What is important for our study is the future direction from quadrant 4 where according to the description of Callon, Courtial, and Laville (1991) are peripheral or undeveloped, that means the *system*, *evaluation*, and *efficiency* of public administration could be the relevant field for research in the future.



**Figure 5 Thematic map, unigram abstracts**

Source authors' own processing in R-Stata Bibliometrix

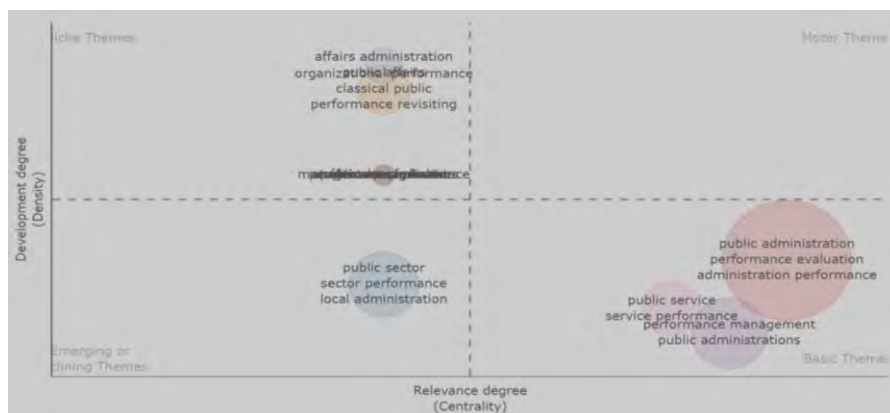
Bigram thematic map, about abstract, represented in figure 6, presented us with a very interesting situation when many clusters are situated in quadrant 1, central and development, with many clusters with different research directions, about the performance of the public entities.



**Figure 6 Thematic map, bigram abstracts**

Source: authors' own processing in R-Stata Bibliometrix

Analysis of words from a title with bigram relation shows us that we have the field of research in the basic quadrant of public service, public administration, performance evaluation, service performance, and performance management, with many publications or niche themes in administration affairs, performance revisiting when the research tries to differentiate from others (Figure 7).



**Figure 7 Thematic map, bigram title**

Source: authors' own processing in R-Stata Bibliometrix

#### 4. CONCLUSIONS

The qualitative analysis of the performance of the public administration in all articles published in the Web of Science database has evolved the concept in the last forty decades. Utilization of the social analysis network in this research helps us to understand the relevance of the specific words in the publication titles or abstracts. The dimensions of the node, betweenness or closeness present a picture of the importance of a few words for this domain: *public, administration, performance, management, and evaluation*. Thematic analysis, based on bigram (two words near together) representation is that the field has some basic or motor theme with many publications in the direction of public performances, public administration, or public evolutions and some niche research direction that could be exploited in the future and could become more relevant for publish and citation.

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## FREE MOVEMENT OF GOODS WITHIN THE EU SINGLE MARKET

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### **Abstract**

*The free movement of goods within the EU single market promotes trade and efficiency among the member states, allowing goods to flow freely between EU countries without customs duties or other barriers. The paper aims to develop the context of the free movement of goods within the EU single market based on a literature review and reports of European and international institutions and organizations.*

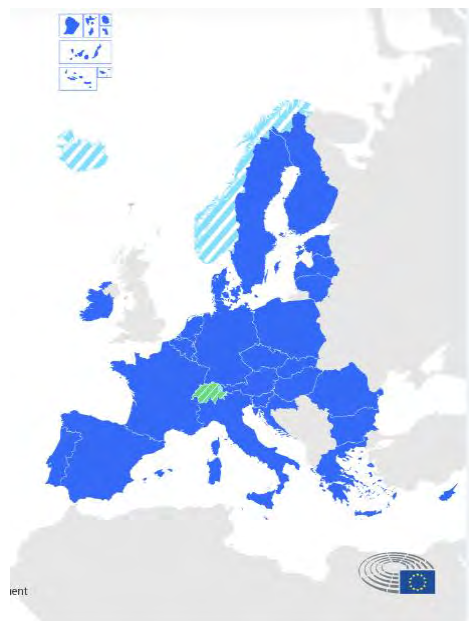
**Keywords:** *single market, free movements of goods, the European Union.*

**JEL Classification:** G15, G18.

### **1. INTRODUCTION**

The European Single Market, alternatively referred to as the European Internal Market or the European Common Market, represents a cohesive economic zone that primarily encompasses the 27 member states of the European Union (EU). With some limited exceptions, it also includes Iceland, Liechtenstein, and Norway through the Agreement on the European Economic Area (EEA), along with Switzerland through specific sectoral agreements (see [Figure 1](#)). This is achieved by enforcing a set of shared rules and standards to which all participating states are legally bound.





Source: [European Parliament \(2023\)](#)

**Figure 1. Countries of the European single market**

According to Figure 1, EU member states are in darker blue. Non-EU states participating via the EEA or having bilateral agreements with the EU in lighter blue. The Single Market's primary objectives are to encourage competition, facilitate specialization, and harness economies of scale. This allows goods and factors of production to flow to regions where demand is higher, thus optimizing resource allocation efficiency. Furthermore, it seeks to promote economic integration, whereby the once-separate economies of member states merge into a unified EU-level economy ([Barnard, 2013](#)). According to a 2019 estimate, the Single Market has led to an average GDP increase of around 9% ([European Commission, 2007](#)) for member countries when compared to a scenario with tariff and non-tariff constraints in place.

The Single Market aims to ensure the “four freedoms” ([Veld, 2019](#)): (i) Free movement of goods; (ii) Free movement of capital; (iii) Free movement of services; and (iv) Free movement of people.

The “free movement of goods” applies to a vast array of “products” and is as comprehensive as the variety of goods in existence. Items are classified as “goods” if and only if they possess economic value, which means they can be quantified in monetary terms and serve as subjects of commercial transactions. For instance, items such as artwork, discontinued coins, and water all fall within the category of “goods” ([EU Publications Office, 2010](#)). However, a noteworthy case arose in 1999 when the European Court of Justice ruled that fishing rights

or permits, despite their connection to a tangible commodity, do not fit the classification of "goods." Instead, they are considered a form of service provision. This ruling further clarified that both capital and services can be assessed financially and can be subjects of commercial transactions but do not fall under the category of "goods" ([23rd European Court of Justice, 1999](#)).

## 2. EEA HISTORY

At its inception in 1957, one of the central goals of the European Economic Community (EEC) was the establishment of a common market characterized by the free movement of goods, services, people, and capital. Initially, the free movement of goods was instituted through the implementation of a customs union among the six member states of that era.

However, the EEC encountered various challenges in realizing a single market, partly due to the lack of robust decision-making structures. Protectionist tendencies made it complex to replace intangible barriers with universally recognized standards and common regulations.

In the 1980s, as the EEC's economy began to lag behind the rest of the developed world, Margaret Thatcher dispatched Lord Cockfield to the Delors Commission to spearhead the revitalization of the common market. The result was a daring White Paper published in 1985, which outlined precisely 300 measures to be addressed for the completion of the single market. This White Paper was warmly embraced, leading to the adoption of the Single European Act, a treaty that reformed the EEC's decision-making mechanisms and set a deadline of December 31, 1992, for the actualization of the single market, which ultimately commenced on January 1, 1993 ([Cockfield, 2017](#)).

The new approach introduced at the Delors Commission encompassed both positive and negative integration, opting for minimization rather than maximization of harmonization. Negative integration entailed prohibitions imposed on member states, prohibiting discriminatory behaviors and other restrictive practices, while positive integration focused on harmonizing laws and standards. Of particular significance (and debate) in this context was the adoption of harmonized legislation under Article 114 of the Treaty on the Functioning of the European Union (TFEU).

The Commission also relied on the jurisprudence of the European Court of Justice, particularly the landmark *Cassis de Dijon* case, which obligated member states to recognize goods lawfully produced in another member state unless they could justify restrictions based on mandatory requirements. Harmonization was employed solely to overcome trade barriers that survived the mandatory requirements test and to ensure essential standards, particularly in matters of health and safety ([Barnes, 2007/2017](#)).

By 1992, approximately 90% of the outstanding issues had been resolved, and in the same year, the Maastricht Treaty embarked on the creation of an

Economic and Monetary Union as the next stage of European integration. Working towards the freedom of services took more time and represented the final freedom to be implemented, primarily through the Posting of Workers Directive (adopted in 1996) and the Directive on Services in the Internal Market (adopted in 2006) (European Union, 2020).

In 1997, the Amsterdam Treaty removed physical barriers within the internal market by incorporating the Schengen Area into the EU's competencies. The Schengen Agreement promoted the abolishment of border controls among most member states, the adoption of common visa rules, and enhanced police and judicial cooperation (BBC News, 2016).

The official objective of the Lisbon Treaty, which came into force in 2009, was to establish an internal market that balanced economic growth with price stability, fostering a highly competitive social market economy aimed at full employment and social progress, all while maintaining a high level of environmental protection and advancing scientific and technological innovation. Despite the Lisbon Treaty's entry into force, some issues related to the four freedoms, especially in the field of services, remained unresolved. These, in conjunction with additional efforts on economic and monetary union, would propel the European Union toward a "European Home Market," representing a significant step in the evolution of the European project (European Parliament, 2016).

In this year, 2023, the European Single Market celebrates 30 years since its foundation (Figure 2).



Source: European Parliament (2023)

**Figure 2. Differences between 1993 and 2023 EU Single Market**

### 3. CUSTOM DUTIES AND TAXATION

The European Union's Customs Union serves to eliminate customs barriers among its member states and enforces a unified customs policy for interactions with external countries, all with the overarching goal of "ensuring fair competition conditions and eliminating any fiscal constraints that could impede the smooth flow of goods within the Common Market.

Article 30 of the Treaty on the Functioning of the European Union ("TFEU") expressly prohibits customs duties between member states, regardless of whether the products originate from within the EU Customs Union or come from third countries. According to Article 29 of the TFEU, customs duties on products from third countries are levied upon their entry into the European Union. However, once these goods have crossed the external borders of the EU, they are free to circulate unrestricted among the member states ([European Commission, 2007](#)).

As a part of the Single European Act, customs controls at the borders between member states have been considerably phased out. Traditional physical inspections of imported and exported goods have been progressively supplanted by audit-based checks and risk analysis methods.

In addition to prohibiting customs duties, Article 30 of the TFEU also extends to taxes that have a similar impact to customs duties. The European Court of Justice established the concept of an "equivalent effect tax" in the *Commission/Italy* case. This definition encompasses any financial burden, irrespective of its magnitude or method of imposition, that is unilaterally placed on either domestic or foreign goods solely because they cross a border. These taxes do not fit the traditional customs duty definition but are considered equivalent effect taxes, even if they are not enforced for the benefit of the state, lack discriminatory or protective attributes, and do not affect domestic products' competitiveness.

A fee is classified as a customs duty if it is directly related to the value of the goods. Conversely, if the fee is linked to the quantity of goods, it is regarded as an equivalent effect tax to a customs duty.

There are three exceptions to the prohibition of imposing charges when goods cross a border, as outlined in the case *Commission against Germany*. A tax is not considered a customs duty or an equivalent effect tax if:

- It is part of a general system of internal taxes applied consistently and under the same criteria to both domestic and imported products.
- It is a consideration for a service provided to the economic operator, calculated in proportion to the service.
- It is subject to specific conditions if it concerns inspections carried out to fulfill obligations imposed by EU law.

Article 110 of the Treaty on the Functioning of the European Union (TFEU) states that no member state may impose, directly or indirectly, any type

of domestic taxation on products from other member states that exceeds that applied directly or indirectly to similar domestic products. Furthermore, no member state may levy domestic taxes that indirectly protect other products (European Commission).

In a case concerning the taxation of rum, the European Court of Justice clarified that Article 110 serves the overarching purpose of ensuring the free movement of goods between member states in normal conditions of competition. This objective is achieved by eliminating any potential protective measures stemming from the application of discriminatory domestic taxes on products from other member states and by ensuring that domestic taxes remain entirely impartial in terms of competition between national and imported products.

The free movement of goods within the European Union is upheld through the customs union and the principle of non-discrimination (Craig, de Búrca, 2015). The EU manages imports from non-member states, forbids customs duties among member states, and allows the unrestricted circulation of imports. Additionally, Article 34 of the Treaty on the Functioning of the European Union expressly prohibits quantitative restrictions on imports and any measures that have an equivalent effect between member states.

In a legal case concerning the taxation of rum, the European Court of Justice elucidated that Article 110 is fundamentally geared towards ensuring the unobstructed movement of goods between member states under fair competitive conditions. This overarching objective is accomplished by eradicating any potential protective measures that might result from the imposition of discriminatory domestic taxes on products originating from other member states. Moreover, it mandates that domestic taxes must remain completely impartial concerning competition between domestically produced and imported goods.

The European Union guarantees the free movement of goods through the customs union and the principle of non-discrimination (Craig and de Búrca, 2015). The EU effectively manages imports from non-member states, prohibits the levying of customs duties among its member states, and facilitates the unrestricted circulation of imports. Furthermore, Article 34 of the Treaty on the Functioning of the European Union explicitly outlaws quantitative restrictions on imports and any measures that could have an equivalent impact among member states.

#### **4. PRODUCT SECTORS**

The EEA Agreement encompasses a wide range of product sectors, each subject to specific technical regulations and legislation. These sectors (EFTA, 2023) include: Construction; Cosmetics; Cultural goods; Hazardous substances; Electrical equipment; Explosives; Fertilizers; Gas appliances; Household appliances; IT/telecommunications/data; Lifting and mechanical handling equipment; Machinery; Maritime equipment; Measuring instruments; Medical

devices; Motor vehicles and tractors; Organic production; Personal protective equipment; Pharmaceuticals; Pressure equipment; Pleasure craft; Steel; Textiles; Tobacco; Wine and spirits.

To ensure the unrestricted circulation of products within the European Economic Area, they must adhere to the standards established by EEA product legislation, which is designed to safeguard health, safety, and the environment. In many sectors, these regulations are complemented by harmonized European standards. Product compliance with the legislation and standards is verified through conformity assessment methods such as testing, inspections, and certifications. Organizations providing conformity assessment services can undergo formal accreditation procedures to validate their competence, independence, and impartiality.

Regulation (EU) No. 1025/2012 recognizes three European standardization organizations (CEN, CENELEC, and ETSI) as bodies capable of receiving requests to formulate European harmonized standards to support sector-specific product legislation or for specific policy objectives. This regulation also facilitates the initiation of standardization requests (previously referred to as mandates) within the services sector and encourages the participation of specific stakeholder representatives in the formulation of European standards, known as Annex III Organizations.

EFTA countries have a longstanding tradition of providing financial support to European standardization through the EFTA Council/Secretariat, often in coordination with the European Commission.

Three primary mechanisms link EFTA countries to European standardization (EFTA, 2023) are as following:

1. All EFTA countries engage in European standardization through their respective national standardization bodies, with Liechtenstein following the Swiss standardization system.
2. EFTA has been in cooperation with the European Commission in supporting standardization efforts since the Luxembourg Declaration was signed in 1984. The framework for this collaboration is outlined in the General Guidelines for Cooperation among EFTA, the European Commission, and European standardization organizations. These guidelines have been further detailed in separate Framework Partnership Agreements for technical and financial support, each individually signed with European Standardization Organizations.
3. European standardization plays a crucial role in the advancement of the European single market and the EEA. Within the framework of the New Approach/New Legislative Framework, standards have provided technical solutions for ensuring compliance with legal requirements established by European legislation. As EEA members, Iceland, Liechtenstein, and Norway adopt this European legislation, while Switzerland, through its

bilateral agreements with the EU, incorporates these principles and the majority of New Approach/NLF directives and regulations into its national legislation.

Annex II, Chapter XIX of the EEA Agreement serves as the legal foundation for standardization within the EEA, with Regulation 1025/2012 being especially relevant in this context.

The authorization of new standardization requests is overseen by the Technical Barriers to Trade (TBT) working group, which includes the active involvement of Iceland, Liechtenstein, and Norway. All matters related to finance and policy are managed by the EFTA Committee on Technical Barriers to Trade (TBT Committee), comprising representatives from all four EFTA nations and reporting to the EFTA Council. The annual budget for EFTA's financial backing of European standardization amounts to approximately €1 million, allocated as annual operating grants to CEN, CENELEC, and ETSI, as well as to the organizations mentioned in Annex III (ANEC, SBS, CES, and ECOS). Additional direct contributions are provided for executing mandates, other standardization work programs, and specific projects (ISO, 1991).

Collaboratively with the European Commission and the three European standardization organizations, EFTA countries are engaged in two international initiatives involving European standardization experts assigned to China (SESEC) and India (SESEI). These projects are overseen by the steering committee, with the EEA represented by the EEA Secretariat as a member.

EFTA has also actively contributed to the establishment of the China-Europe Standards Information Platform (CESIP), a database connecting European and Chinese standardization efforts. This platform facilitates the exchange of information regarding relevant standards within specific product sectors, benefiting both European and Chinese partners and promoting greater accessibility for industries, particularly SMEs, to respective markets and regulatory prerequisites.

In addition, EFTA has actively participated as a partner in the Joint Initiative on Standardization, an initiative stemming from the European Commission's Single Market Strategy. This collaborative effort aimed to modernize the European standardization system and enhance the existing public-private partnership between the Commission/EFTA and European standardization organizations and stakeholders.

Information on European standardization: European standardization serves as a crucial facilitator of the unhindered movement of goods and services within Europe. Its key objectives encompass (ISO, 1991):

- Eliminating technical trade barriers by establishing a common point of reference for trade.
- Providing a shared and transparent reference for public procurement.



- Supplying recognized benchmarks for quality, certification, and regulatory compliance.
- Promoting European technical integration by harmonizing national and European legislation.
- Fostering technical collaboration and knowledge exchange.
- Strengthening European competitiveness by establishing a common, yet adaptable, technical framework throughout the single market.
- Offering a versatile mechanism for achieving consensus on identified issues within Europe, taking into account diverse stakeholder requirements, industry sectors, regulatory contexts, and factors such as product safety and environmental impact.
- Advocating European interests in the global economy and creating avenues for global market access.
- Providing a reference tool for technical assistance and cooperation with third countries.

Key European standardization organizations include:

- CEN – responsible for general standardization across various sectors, except electrical and electronic equipment and telecommunications.
- CENELEC – focused on standardization in the field of electrical and electronic equipment.
- ETSI – responsible for standardization in the field of telecommunications.

EU/EFTA co-funded stakeholders involved in European standardization (Annex III organizations) encompass:

- ANEC – representing consumer interests.
- ECOS – representing environmental concerns.
- SBS – advocating for the interests of small and medium-sized enterprises.
- CES – representing worker interests.

Verification of compliance with regulations and standards relies on various approaches, including testing, inspections, and certifications. Entities offering these services can officially establish their competency, independence, and neutrality through accreditation.

As per Regulation (EU) 765/2008, accreditation is the formal recognition by a National Accreditation Body that a Conformity Assessment Body satisfies the requirements stipulated in harmonized standards and, when applicable, any supplementary criteria outlined in sector-specific schemes. Accreditation authorizes these bodies to conduct specific conformity assessment activities.

Accreditation serves the broader public interest across all industry sectors by ensuring that accredited entities providing services such as testing, examination, calibration, certification, inspection, and verification possess the requisite technical proficiency and maintain impartiality to verify that products



and services conform to relevant standards and regulations. For example, products are produced in accordance with specific quality, safety, or protection standards. Laboratories or certifiers evaluate and confirm this compliance. Reports and certificates attached to products are widely trusted when issued by accredited laboratories or certifiers.

Trust in products and services, regardless of their origin, is strengthened through accreditation, backed by established multilateral agreements endorsed by National Accreditation Bodies (NAB) in Europe and around the world. When signatory parties recognize that the provided accreditation is equally trustworthy, it means that products don't need to undergo repeated testing or certification for every new market. A single round of testing and certification by an accredited laboratory or certifier is adequate for acceptance anywhere. Through accreditation and the consistent application of harmonized standards, consumers can have confidence in products and services when making purchases in the European market.

Annex II, Chapter XIX of the EEA Agreement forms the legal basis for accreditation within the EEA, with Regulation 765/2008 playing a central role.

EA, the European Cooperation for Accreditation, is a non-profit organization formally designated by the European Commission under Regulation (EC) No. 765/2008 to establish and uphold a multilateral agreement for mutual recognition, known as the EA MLA. This agreement operates based on a standardized accreditation framework and aims to facilitate fair trade, ensure the quality of products and services, and reduce technical trade barriers.

EA members are National Accreditation Bodies (NAB) officially recognized by their respective national governments to assess and verify organizations engaged in conformity assessment activities, which include certification, verification, inspection, testing, and calibration, in accordance with international standards.

EFTA provides financial support to EA, in addition to the European Commission, through a framework partnership agreement and annual operational grants.

## **5. CONCLUSION**

The development of European standards and the removal of conflicting national standards have played a pivotal role in the establishment of a unified European market for goods. Standardization is a market-oriented process in which various stakeholders collaborate to define technical specifications concerning issues related to health, safety, the environment, and interoperability.

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## CONSIDERATIONS REGARDING THE INFLUENCE OF THE JURISPRUDENCE ON THE LAW NO. 31/1990 ON COMPANIES

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### **Abstract**

*In Romania, Law no. 31/1990 constitutes the key legislative framework for companies, which contains legal provisions regarding their establishment, organization, operation, dissolution. This law underwent multiple changes, which occurred either because of the activity of the ordinary or secondary legislator, or as a consequence of the pronouncement of some court decisions on the matter.*

*After a general presentation of Law no. 31/1990, some decisions of the High Court of Cassation and Justice and of the Constitutional Court are commented, then, in detail, emphasizing their impact on the studied field.*

*Through the prism of the aspects examined, we believe that the present study is of real use both to researchers in the field, to the legislator, and especially to the courts, which effectively interpret and apply the legal norms of Law no. 31/1990.*

**Keywords:** *societies, legislation, jurisprudence, Romania.*

**JEL Classification:** N44

### **1. INTRODUCTORY CONSIDERATIONS**

The law no. 31/1990 represents the basic legislative framework regarding the legal regime of companies, which refers to their constitution, organization, operation, dissolution. Some changes occurred in the content of this law were the consequence of the pronouncement of some significant court decisions in the field.

In the present study, some relevant decisions of the High Court of Cassation and Justice, pronounced either in the resolution of the appeal in the interest of the law, or to solve some legal issues, are analysed in detail; in this way, it was aimed to achieve a uniform and unitary interpretation of the legal norms contained in Law no. 31/1990, in order to give more coherence and clarity to the regulations on the matter. Also, a decision of the Constitutional Court is taken into account, by which it removed from the normative field a provision of Law no. 31/1990, which did not allow the decisions of the board of directors or the directorate to increase the share capital to be appealed in court.

## 2. GENERAL ASPECTS REGARDING THE LAW NO. 31/1990

The law no. 31/1990 does not provide a definition of companies, but the doctrine explained and developed this concept. It is necessary to mention that the notion of society has a double meaning. In a first sense, it represents a distinct legal subject, which acquires legal personality from the moment of its registration in the Trade Register, “a grouping of persons and capitals, constituted for profit” (Nasz, 2019, p. 11), which arises through a company contract and which contains three essential elements: the obligation assumed by each partner to pool a patrimonial value (the contribution); the intention to jointly carry out an activity that is the object of the company; the participation of all associates in the achievement and sharing of benefits. In the same sense, the company is “the legal form of exploitation of an economic enterprise”(Cărpenu, 2019, p. 118), “a merchant, which is established as such, in order to carry out acts of commerce” (Cărpenu, Piperea, David, 2002, p. 8). It was also stated that the companies are professionals, within the meaning of art. 3 of the Civil Code, to whom the provisions of the Civil Code relating to the obligations generated by the operation of the enterprise whose owner is the company are directly applied (Cărpenu, Piperea, David, 2014, p. 2).

In another sense, according to art. 1881 of the Civil Code, the company is a contract, by which “two or more persons oblige each other to cooperate for the performance of an activity and to contribute to it through monetary contributions, in goods, in specific knowledge or benefits, with the aim of sharing the benefits of using the economy that could result. Each partner contributes to bearing the losses in proportion to their participation in the distribution of the benefit, if the contract has not been established otherwise. The company can be established with or without legal personality” (Șandru, 2017, pp. 18-19). From this definition, the legal literature has systematized the defining elements, as well as the legal characters of a company contract (Tofan, Popescu, Grădinaru, 2021, pp. 138-139; pp. 252-253; Cărpenu, 2019, pp. 118-120; Cadariu-Lungu, 2014, pp.18-28).

The law no. 31/1990 is structured in titles. The first of these concerns general aspects of companies. In this sense, five types of companies are established: the Romanian Collective-Name Company (SNC company), the Romanian “sleeping partnership company” (SCS company), the Romanian “partnership limited by shares company” (SCA company), the Romanian joint-stock company (SA company) and the Romanian limited liability company (SRL company). On the one hand, they have a distinct legal regime, which determines, for each, a series of benefits and risks. On the other hand, they share some common characteristics. Thus, the method of setting up companies is relatively similar, with certain differences, which are not significant. Also, all companies can have associates or shareholders, as natural persons, but who do not acquire the quality of business professionals. The share capital can take the form of

contributions in cash or goods and can be deposited or constituted by associates or shareholders. At the same time, the share capital cannot be financed from the non-refundable funds granted through European projects.

It is necessary to mention, in this context, the European company (SE), which can be constituted, in the form of a joint-stock company (SA), according to the Law no. 31/1990, the Government Decision no. 187/2007, the Council Regulation (EC) No 2157/2001 of 8 October 2001 on the Statute for a European company (SE), the Directive 2005/56/EC of the European Parliament and of the Council of 26 October 2005 on cross-border mergers of limited liability companies, the Directive (EU) 2017/1132 of the European Parliament and of the Council of 14 June 2017 relating to certain aspects of company law.

It is necessary to specify the fact that national societies, national companies and commercial companies with majority state capital benefit from a derogatory legal regime from Law no. 31/1990, which is established by the Government's Emergency Ordinance no. 8/2003, which aims at the process of restructuring, reorganization and privatization of such legal entities.

Title II of Law no. 31/1990 refers to the establishment of companies and it addresses issues related to: the company's constitutive act; the specific formalities for the establishment of the joint-stock company by public subscription; the registration of the company; the effects of violating the legal requirements for establishing the company; some procedural rules.

Title III of the law in question includes legal regulations regarding the functioning of companies, and the next title refers to the amendment of the constitutive act. Title V covers the exclusion and withdrawal of associates, and Title VI deals with the dissolution, merger and division of companies. Title VII addresses the issue of liquidation of companies, and Title VII<sup>1</sup> contains provisions regarding the European company.

Title VIII enshrines contraventions and crimes. Rightfully so, in the legal literature (Hotca, 2019, p. 11) it was appreciated that the rules of incrimination contained in the Law no. 31/1990 has special (derogatory) incrimination rules, as compared to those existing in the Criminal Code [art. 295 (embezzlement), art. 297 (abuse of service) etc.], because they have priority, unless the punishment of the Criminal Code is more severe, according to the art. 281 of Law no. 31/1990.

The last title contains final and transitory provisions.

### **3. THE ROLE OF JURISPRUDENCE ON THE ANALYZED LEGISLATION**

The influence of judicial practice on the analyzed field was essential in establishing a unitary meaning to various legal regulations, which were often interpreted and applied differently by the courts. Also, the existence of some imperfections of the law in question determined the expression of divergent

points of view of the judges related to the solutions adopted by them regarding the actual implementation of the examined provisions.

### **3.1. Decision of the High Court of Cassation and Justice no. 22 of June 12, 2006 for the resolution of the appeal in the interest of the law**

The High Court of Cassation and Justice, constituted in United Sections, met to examine the appeal in the interest of the law, declared by the general prosecutor of the Public Prosecutor's Office attached to the High Court of Cassation and Justice, who requests the admission of the appeal and the establishment by the supreme court that the requests for authorization of the establishment and the registration of consultancy, assistance and legal representation companies are inadmissible.

In judicial practice, it was found that there is no unified point of view regarding the application of the provisions of art. 46 para. (1) from Law no. 31/1990 amended. In this sense, some courts accepted the requests made by legal advisers, authorized the establishment, and ordered the registration in the Trade Register of some companies whose sole object of activity is the carrying out of legal activities consisting of assistance, consultancy, legal representation and drafting of legal documents. These courts considered that the provisions of art. 21 of the Statute of the profession of legal advisor allow, pursuant to Law no. 31/1990, the establishment of legal entities, with the character of a professional society, by one or more legal advisers, entered in the tables kept by the territorial colleges.

Other courts rejected such requests, reasoning that, according to the provisions of art. 3 and 4 of the Commercial Code, by which commercial acts are defined, legal activities do not constitute commercial acts or facts. Also, the Law no. 514/2003 on the organization and exercise of the profession of legal advisor does not provide for the possibility of establishing legal advisers in commercial companies. Therefore, the art. 21 of the Statute of the profession of legal advisor is in contradiction with the dispositions of Law no. 514/2003.

The law no. 514/2003 does not contain any rule that allows the association of legal advisers in commercial companies with the purpose of carrying out legal activities of the nature mentioned, the only form of association allowed being regulated by art. 5, according to which "legal advisers can form professional associations for the purpose of defending and promoting professional interests, under the conditions of the law on the association and establishment of legal entities"; this latter form of association can only be achieved in compliance with Government Ordinance no. 26/2000 on associations and foundations.

The article 21 of the Statute of the profession of legal adviser, adopted by the Extraordinary Congress of the Colleges of Legal Advisers in Romania on

March 10, 2004, contravenes the provisions of the Law no. 514/2003, as well as the provisions of the Law no. 31/1990, according to which legal consulting and legal representation activities are not considered commercial acts or facts. The previously mentioned Art. 21 also violates the imperative norms provided by Art. 67-81 of the Civil Procedure Code, which concern the representation of parties in court and legal assistance.

Consequently, the High Court of Cassation and Justice established that, in relation to the provisions of art. 46 para. (1) from the Law no. 31/1990, republished, with subsequent amendments and additions, the requests for authorization of the establishment and registration of commercial companies for consultancy, assistance and legal representation are inadmissible.

### **3.2. Decision of the Constitutional Court no. 382/2018 regarding the exception of unconstitutionality of the provisions of art. 114 paragraph (3) of Law no. 31/1990**

The Constanța Court of Appeal - Second Civil, Administrative and Fiscal Litigation Section and the Constanța Court - Second Civil Section notified the Constitutional Court with the exception of the unconstitutionality of the provisions of art. 114 paragraph (3) of the Companies Law no. 31/1990. This exception was raised by Dragoș Băldescu, Mariana Georgescu and Paul-Alexandru Băldescu, in cases that had as their object the settlement of appeals filed against the decisions of the court, through which the requests for annulment of some decisions of the board of directors, by which it was decided to increase the share capital, were rejected, as inadmissible, as well as the settlement of the action for the annulment of a decisions of the general meeting of shareholders.

The Court found that, although the three constitutive elements of a joint-stock company (the registered office, the object of activity, the increase of the share capital) have the same regime in terms of their establishment and modification, the legislator regulated, by art. 114 para. (3) from Law no. 31/1990, a distinct legal regime regarding the possibility of challenging them in court. Thus, only the decisions of the board of directors/directorate given in the execution of the decisions of the general meeting of shareholders delegating the attributions to change the registered office and the secondary object of activity can form the object of the annulment action. Therefore, the exclusion from judicial control of the decisions of the board of directors or directorate to increase the share capital means the impossibility of a court verifying the fulfilment of the conditions provided for by law by a constitutive act. Thus, the legislative solution established by the provisions of art. 114 paragraph (3) of Law no. 31/1990 is likely to affect the substance of the right of free access to justice, established by the art. 21 of the Romanian Constitution.

The Court ruled that the criticized legal text does not establish limitations or conditions of the right of free access to justice, aspects compatibles, in principle,



with its intrinsic requirements, but refuses the benefit of this fundamental right to the people whose rights were affected by the decisions of the board of directors or directorate for increasing the share capital; therefore, the lack of judicial control in the analyzed matter constitutes a violation of access to justice.

Consequently, by its decision, the Constitutional Court admitted the exception of unconstitutionality and ruled that the legislative solution contained in art. 114 para. (3) from the Companies Law no. 31/1990, which does not allow legal appeals, through the annulment action provided for in art. 132 of the law, of the decisions of the board of directors, respectively the directorate taken in the exercise of the delegated attribution of increasing the share capital, is unconstitutional. Thus, during the period August 1, 2018 - September 14, 2018, the regulation of the Companies Law no. 31/1990 declared non-compliant with the fundamental act was legally suspended and came out of force on September 15, 2018, because neither the Parliament nor the Government complied with the decision of the Constitutional Court, as stipulated in the article 147 para. 1 of the Constitution.

### **3.3. Decision no. 7/2020 of the High Court of Cassation and Justice (The Complement of judges for resolving some legal issues)**

The High Court of Cassation and Justice (Complement for resolving legal issues) admitted the referral made by the Oradea Court of Appeal - Section II civil, administrative and fiscal litigation, in order to pronounce a preliminary decision regarding the following legal matter : "If, in the interpretation of the provisions of art. 132 of the Companies Law no. 31/1990, republished, with subsequent amendments and additions, in relation to art. 116 of the same law, the adopted decisions can also be challenged in court, with an action for annulment by the special meeting of shareholders".

Through the action in court registered on the roll of the Bihor Court on May 22, 2017, the complainant A, a natural person, requested, contrary to the defendant B, a joint-stock company, the declaration of absolute nullity of the decision of the special meeting of the shareholders of this company, with obliging the defendant to pay the court costs caused by the trial. The plaintiff reasoned that the object of the decision of the special meeting of shareholders is the conversion of a number of 240 bearer shares with a nominal value of 110 lei, in a total amount of 26,400 lei, representing 24% of the company's share capital, into preferential shares with a priority dividend for shareholder A. In order to justify the annulment of the decision, the complainant listed: the adoption of the decision by an incompetent body, because the power to order the conversion of shares from one category to another belongs to the extraordinary general meeting of shareholders; non-compliance with the quorum and majority conditions required by law; failure to fulfil the legal advertising conditions; abusive exercise of voting right by shareholder C, joint-stock company.

Defendant B requested the rejection of the action, specifying that the formulation of an action to annul the decision of the special meeting of shareholders is inadmissible, because art. 132 of Law no. 31/1990 considers only the decisions of the general meeting of shareholders.

The Bihor Court admitted the plaintiff's action and declared null and void the decision of the special meeting of the shareholders of the defendant company B. The latter filed an appeal, requesting the rejection of the plaintiff's action.

The Oradea Court of Appeal - Section II civil, administrative, and fiscal litigation declared itself competent to resolve this litigation. It formulated a request for a preliminary ruling pronounced by the supreme court, to prevent the emergence of a non-unitary judicial practice in the matter.

Art. 132 of Law no. 31/1990 refers to the legal challenge of decisions adopted by the general meeting of shareholders.

Most of the specialists in the field, who were consulted on this occasion, found that from the interpretation of the article 116 para. (2) and (3) from Law no. 31/1990 results that the law establishes a double and reciprocal conditioning between the decisions pronounced by the general assemblies and those pronounced by the special assemblies. Thus, the decision of the general assembly in the matter cannot exist, it does not produce legal effects in the absence of the decision of the special assembly. Reciprocally, the resolution of the special meeting must be approved by the general meeting. The doctrine also stated that compliance with the principle of free access to justice can only be ensured by admitting the possibility of attacking in court the decisions of the special assembly under the same conditions as the decisions of the general assembly. It was also emphasized that, in view of this legislative gap, only a proposal for a *lege ferenda* is likely to ensure the procedural basis for the formulation of actions in court with the object of contesting the decisions issued by the special assembly.

Most of the courts consider that the decisions of the special meeting of shareholders can be challenged in court with an action for annulment, based on the provisions of art. 132 related to art. 116 of Law no. 31/1990. A first argument refers to the fact that any legal act can be subject to judicial control, because, otherwise, access to justice would be restricted and thus there would be a violation of art. 6 of the Convention for the Protection of Human Rights and Fundamental Freedoms. Then, it is argued that art. 132 para. (2) from Law no. 31/1990 is a norm of general applicability, which is also valid in the case of special meetings, based on art. 1 paragraph (2) of the Civil Code, according to which in cases not provided for by law, the legal provisions regarding similar situations are applied.

The High Court of Cassation and Justice appreciated that, considering the mutual conditioning of the decisions of the two assemblies, the decision-making process would be easier to the extent that each of the two decisions would be

challenged in court separately, for its own irregularities of conduct. In this way, the resumption of the entire procedure and affecting the functioning of the company would be avoided.

Therefore, the supreme court decided that: “in the interpretation and application of the provisions of art. 132 of the Companies Law no. 31/1990, republished, with subsequent amendments and additions, related to art. 116 of the same law, decisions adopted by the special meeting of shareholders can also be challenged in court, with an action for annulment”.

### **3.4. Decision no. 55 of September 21, 2020 of the High Court of Cassation and Justice (The Complement for resolving some legal issues)**

The High Court of Cassation and Justice - The Complement for resolving some legal issues examined the referral made by the Oradea Court of Appeal - Section II civil, administrative, and fiscal litigation, to pronounce a preliminary ruling on the following legal issue: “if, in the interpretation of the provisions of art. 195 para. (3) from Law no. 31/1990, the 10-day period begins to run from the date of dispatch/deposit at the post office of the convocation by registered letter or from the date of its effective reception by the associates”.

The article 195 para. (3) from the Companies Law no. 31/1990 amended provides: “[...] The convening of the meeting will be done in the form provided for in the constitutive act, and in the absence of a special provision, by registered letter, at least 10 days before the day set for its holding, showing the order of the day”.

Through the annulment action registered before the Bihor Court on December 11, 2018, plaintiff A requested, contrary to defendant B, the annulment of the decision of the general meeting of associates of May 29, 2018, adopted by associates C and D, for violating the provisions of Law no. 31/1990 and of the constitutive act of B. The Bihor Court admitted the action filed by plaintiff A and ordered the annulment of the decision of the general meeting of associates. It found that the lack of convocation of the associate/irregularity of the convocation by not respecting the 10-day deadline for general meetings, according to art. 195 para. (3) from Law no. 31/1990, is sanctioned with the absolute nullity of the decisions adopted, nullity arising from the serious and irremediable violation of the associate's rights to information and to take part in the decisions regarding the company's activity.

Defendant B filed an appeal against this decision, requesting the admission of the appeal and the complete change of the contested sentence in the sense of rejecting the action filed by plaintiff A. The Oradea Court of Appeal - Section II civil, administrative, and fiscal litigation established that the term of 10 days provided by art. 195 para. (3) from the Law no. 31/1990 flows from the effective reception of the convenor by the associates. The court of appeal found the

admissibility of the referral to the High Court of Cassation and Justice, to issue a preliminary ruling.

Some of the courts consulted in this case believe that the 10-day period begins to run from the date of dispatch to the post office of the convocation by registered letter. Most of them appreciate that this term runs from the date of effective reception of the convocation, by registered letter, by the associates. Thus, when establishing this term, the legislator's intention was to allow the associates to be properly informed about the issues on the agenda and to be able to vote in full knowledge of the case in the general meeting for which they were convened.

The supreme court specified that, for the limited liability company, the convener, as a unilateral legal act according to art. 1,324 of the Civil Code, takes effect on the date of its display and distribution to associates. The convener's communication is, therefore, a natural condition for the exercise of the voting right of each of the associates. According to art. 1.326 para. (1) of the Civil Code, communication is mandatory for the issuer "when it establishes, modifies or extinguishes a right of the recipient and whenever informing the recipient is necessary according to the nature of the act". Also, informing the recipient, as the holder of the right to vote, is necessary, because only in this way he can effectively exercise this right.

It was also shown that, in fact, the convener of the general meeting of the shareholders of the limited liability company is a legal act subject to communication, as a condition for its effectiveness, and implies bringing it to the attention of the recipients, identified in the person of the associates. Its legal force cannot thus be opposed until the date of communication, presumed by law to have been achieved on the date when the communication reaches the addressees.

Finally, the supreme court concluded that the interpretation of the provisions of art. 195 para. (3) from the Law no. 31/1990, republished, with subsequent amendments and additions, the 10-day term begins to run from the date on which the convening of the general meeting by registered letter reached the addressees, if in the constitutive act or on the basis of a special provision of the law it is not provided another way of communication.

### **3.5. Decision no. 28 of May 10, 2021 of the High Court of Cassation and Justice (The Complement for resolving some legal issues)**

The High Court of Cassation and Justice - The Complement for resolving some legal issues admitted the referral made by the Oradea Court of Appeal - Civil Section II regarding the resolution of the following legal issue: "if the situations of exclusion of the associate provided for by art. 222 of Law no. 31/1990 are supplemented with the provisions of art. 1,928 of the Civil Code".

The law on companies lists the situations in which an associate can be excluded from a company in the collective name, in simple limited partnership, in limited partnership with shares, with limited liability.

Art. 1,928 of the Civil Code states that “at the request of an associate, the court, for valid reasons, may decide to exclude any of the associates from the company”.

Through the Application registered on February 22, 2018 before the Bihor Court – Second Civil Section, the plaintiffs A S.R.L. and B (administrator and associate of the company) requested the court to order the exclusion of the defendant C (associate) from the company A S.R.L. and to rule on the redistribution of the defendant's social shares. In the motivation, serious misunderstandings between the associates were cited, likely to prevent the activity of the plaintiff company. The defendant filed a counterclaim, by which he requested the exclusion of the plaintiff-defendant B from the company, based on the provisions of art. 222 para. (1) lit. d) from the Law no. 31/1990 for fraud to the detriment of the company and, in the alternative, the dissolution of the company A S.R.L. The court rejected the counterclaim and admitted the main claim, ordered the exclusion of the defendant-claimant C from the company A S.R.L., assigned the shares held by him to the plaintiff-defendant B and obliged A S.R.L. upon payment of the consideration of the shares belonging to the defendant-plaintiff. Against this sentence, the defendant-plaintiff C. filed an appeal, which claimed, *inter alia*, that the provisions of art. 1,928 of the Civil Code, which represents the general norm, are removed from the application of the special norm, contained in art. 222 para. (1) lit. d) from the Law no. 31/1990.

The court of appeal notified the High Court of Cassation and Justice, with a view to issuing a preliminary ruling, which would clarify whether the situations of exclusion of the associate provided for by art. 222 of the Law no. 31/1990 are supplemented with the provisions of the Civil Code. Pronouncing a solution by the supreme court was necessary because the opinions expressed in this regard by different courts in Romania were divergent.

The supreme court emphasized that the general law is applied in any matter and in all cases, except in those in which the legislator has established a special and derogatory regime, establishing in certain matters special regulations, which have priority over the norm of common law. This orientation is also reflected by art. 15 of the Law no. 24/2000 on legislative technical norms for the elaboration of normative acts.

It was also specified that the special norm, being derogatory from the general norm, is applied with priority, even when it precedes the general norm, whenever a hypothesis falls under its provisions, and the special norm can be modified or repealed by a later general rule only expressly. Also, the list included in art. 222 para. (1) from the Law no. 31/1990 is not exemplary, which determines the impossibility of exclusion from the limited liability company in

situations other than those regulated by the special law. At the same time, according to art. 138 of the Law no. 71/2011 for the implementation of the Law no. 287/2009 on the Civil Code, the companies regulated by special laws continue to be subject to them.

The decision of the supreme court was that the situations of exclusion of the associate provided by art. 222 of Law no. 31/1990, republished, with subsequent amendments and additions, is not supplemented with the provisions of art. 1,928 of Law no. 287/2009 regarding the Civil Code.

#### 4. CONCLUSIONS

Since its adoption, Law no. 31/1990 has seen numerous changes, some of which intervened through the action of the legislator, others because of the existence of some decisions of the Constitutional Court pronounced on the matter.

Jurisprudence had a particularly important role in clarifying the meaning that the legislator conferred on some legal regulations of the Law no. 31/1990, to remove their divergent interpretations by the courts. The latter often had opposing orientations and solutions, which affected, over time, the security of the legal norms under analysis. In this way, the goal desired by the High Court of Cassation and Justice was achieved, embodied in the uniform and unitary application of the relevant legislation. In some situations, it was found that the application of the legal regulations regarding companies from the Civil Code, which represents the general legal framework in the matter, was required; in other cases, however, the provisions enshrined in the Law no. 31/1990 are of strict interpretation, having priority of application of the special law.

Also, through the Decision of the Constitutional Court cited above, the lack of legal effects of art. 114 para. 3 of the Law no. 31/1990, by which the decisions of the board of directors or directorate to increase the share capital, given in the execution of the decisions of the general meeting of shareholders on the delegation of powers, could not be challenged, through an action for annulment. Thus, the legal provision declared non-compliant with the Constitution practically removed the free access to justice of the persons whose rights were affected.

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## **EU Public Administration Integration and Resilience Studies**

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