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Cluster analysis of creative industries in the EU

Abstract. The importance of creative industries is continuously rising. Although relevant questions were first discussed in 1998, the studies of this topic have been very local and focused only on a limited number of countries. Based on this, the purpose of the present paper is to analyse creative industries in the member states of the European Union. Our objective is to determine factors which are supposed to have a positive impact on further development of creative industries. The status of creative industries in the European area is very different. Therefore, we have decided to divide all the countries studied according to the results reflected in the selected variables. Cluster analysis has been applied to define groups of countries with similar results in selected categories according to Florida's technology – talent – tolerance approach. The data are presented in 9 variables for the 28 member states of the EU. The new findings relate to the selection of countries with good perspective for further development of creative industries. The results of the research will help to focus on support programs and financing of the most crucial areas of the EU.
Keywords: Creative Industries; Cluster Analysis; Florida; 3T
JEL Classification: Z10; R11

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Кластерний аналіз креатвних індустрій в ЄС
Анотація. Метою даної роботи є аналіз креативних індустрій в Європейському Союзі. Для визначення груп країн з аналогічними результатами в окремих категоріях був використаний кластерний аналіз. Дані представлені 9 змінними для 28 країн-членів ЄС. Отримані результати допоможуть зосередити увагу на визначенні перспективних країн стосовно подальшого сприяння розвитку креативних індустрій.
Ключові слова: креативні індустрії; кластерний аналіз; Флорида; 3T.

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Кластерный анализ творческих индустрий в ЕС
Аннотация. Целью данной работы является анализ творческих индустрий в Европейском Союзе. Для определения групп стран с аналогичными результатами в отдельных категориях был использован кластерный анализ. Были исследованы 9 переменных для 28 стран-членов ЕС. Полученные результаты будут способствовать определению перспективных стран для дальнейшего содействия развитию творческих индустрий.
Ключевые слова: творческие отрасли; кластерный анализ; Флорида; 3T.

1. Introduction

Creative industries are nowadays in the centre of attention of European policies. Currently, culture and creativity play a key role in various programmes such Europe 2020 or Creative Europe. Although the debate about creative industries started in the European area in the United Kingdom in the 1990s, and later in some other EU member states, it is only now when these sectors are recognised and supported. At the EU level, creative industries were given their status in 2010 with the Green Paper – Unlocking the potential of cultural and creative industries. For the past five years, creative industries have become quite a discussed topic. However, there is still a lack of public interest as well as academic research. One of the biggest problems of this is also the shortage of relevant data. The data are collected at the national level. There is no consistency and sometimes there are no statistical data at all. In this paper, we are trying to analyse the current status of creative industries in the EU based on the factors influencing the positive development of these industries. With the help of cluster analysis, we group the member states according to similar characteristics. The result is the creation of four clusters of countries according to the success reflected in the selected variables.

2. Brief Literature Review

Creative industries have recently become more discussed in the whole Europe. As mentioned in the Introduction, the topic is relevant, but it is not new. The United Kingdom recognized and emphasized the role of these economic sectors in the 1990s. But the real debate and focus on creative industries in the European Union started only few years ago. The key date was the release of Green Paper on Unlocking the potential of cultural and creative industries in 2010. The Green Paper aimed to instigate a discussion on stimulating environment for cultural and creative industries. Its creation was based on the activities of two working groups and several independent studies as well as national initiatives in the EU member states. The paper reads: «In order to be able to fully unleash their dual cultural and economic potential, taking full

advantage of the abovementioned drivers, CCIs need an increased capacity for experimenting and innovating, access to the right mix of skills and access to funding» (European Commission , 2010) [1].

Creative industries are also included in the one of the most important EU programs – EUROPE 2020. They are closely related to smart growth priority with the focus on education, research and innovation. Smart growth priority also includes the Digital Agenda for Europe.

The Creative Europe programme represents the closest point of support for cultural and creative industries – the support aimed at cultural and creative industries for the period of 2014-2020. The document identified creative industries as underdeveloped and undercapitalized and specified several objectives:

1. To support the capacity of cultural and creative industries at the international level;

2. To promote of international circulation of cultural and creative works as well as the authors themselves and gaining new audiences not only in the EU;

3. To ensure the development of policies to promote cultural and creative industries and innovation and contribute to international cooperation in the development of such policies;

4. To strengthen the financial capacity of cultural and creative industries (European Commission, 2013) [2].

We have decided to analyse the current environment created for cultural and creative industries in the EU because of their greater support and recognition from EU, also because of the lack of previous research of this topic.

For a start, we have to define what sectors should become the object of the analysis. Creative industries have several definitions. Basic theories emphasize their economic character (Howkins, 2001) [3], cultural dimension (Thorsby, 2001) [4] and creative people as the cornerstone of their existence (Florida, 2002) [5]. When analysing the economic impact of creative industries, a sectorial approach is used (DCMS, 2014) [6]. This approach enables to measure and compare data for each creative sector. However, the question is how to evaluate the potential of countries to develop creative industries. Florida looks at the creative economy mainly through people. He defines the creative class – creative workers. These are not only artists, but also lawyers, economists, teachers, scientists (Florida, 2002) [5]. With this approach, Florida exceeds limited understanding of creative industries. Therefore, we take Florida's theory as a basis for our research; we have tried to connect sectorial British approach with Florida's 3T concept. Florida states the influence of various factors classified into three main groups: technology, talent and tolerance.

Technology is one of the least controversial components of his concept, since technology is generally accepted as a driver of growth and innovation. The author emphasizes the role of high-tech industry and its positive effect on the development of creative industries. In his studies, he confirmed that creative industry is rising well where the high-tech industry is concentrated. Florida also uses a number of patents granted in the region in his index. Both of these factors are therefore taken into account in our analysis. We have decided to take into consideration the data with regard to the daily use of the Internet, because the Internet is one of the megatrends which has a major impact on the change of the supply chain of creative industries, especially the music industry.

According to Florida, talent materializes Florida in human characteristics such as knowledge, skills, ambition, and entrepreneurship. In his research, the author uses the concept of a creative class that represents people with the aforementioned characteristics. To simplify the 3T index, talent is expressed in tertiary education. Further, Florida mentions scientists and researchers. Therefore, science and research is included in the cluster analysis, too.

Tolerance is the most controversial part of Florida's concept. Tolerance can be simplistically understood as openness to different opinions, ideas, values and beliefs, as well as respect for diversity. In his theory about the importance of tolerance for creative industries, Florida relies on authors such as J. Jacobs and R. Inglehart. He expresses the tolerance of immigrants, gays, bohemians. However, it would be very hard to consider these in the European area because we can rarely find any relevant data. Therefore, only immigrants' statistical information was taken into consideration in the analysis.

3. Purpose

To determine factors which may have a positive impact on further development of creative industries using cluster analysis.

Selection of variables and clustering method

The first step of the analysis was to determine the input data. Since at the EU level there is no separate account for the creative industries, we decided to apply sectorial British approach and allocate individual economic activities according to the NACE Rev. 2 statistical classification adopted on the basis of the European Parliament and Council Regulation (EC) No. 1893/2006 of 20 December 2006 by mandatory member states. The following categories were chosen for cluster analysis:

• J.58 – Publishing activities;
• J.59 – Motion picture, video and television programme production, sound recording and music publishing activities;
• J.60 – Programming and broadcasting activities;
• J.62 – Computer programming, consultancy and related activities;
• J.63 – Information service activities;
• M.71 – Architectural and engineering activities; technical testing and analysis;
• M.72 – Scientific research and development;
• M.73 – Advertising and market research;
• M.74 – Other professional, scientific and technical activities (European Commission, 2010) [7].

The selection of specific NACE categories was determined by several factors. We applied sectorial British approach and a selection of the creative industries by the Department for Culture, Media and Sport (DCMS). But, our division does not absolutely copy the British definition. The reason for this is the lack of statistical data of Eurostat. Therefore, we were not able to include categories R.90 – R.93, capturing arts, entertainment and recreation in our research. Although art is one of the key sectors of the creative industries and we absolutely understand its importance, we were not able to get the required data in a satisfying form. These categories were excluded. As indicators, we selected the following:

Technology
• Number of patent applications;
• Number of employees in high-tech sectors;
• Percent of Daily Internet users.

Talent (creative class) represents:
• Number of participants in higher education;
• Number of university graduates;
• Number of employees in R&D;
• Total expenditure on R&D;
• Number of scientists.

Tolerance is included as immigration.

For the cluster analysis, the XLSTAT statistical software was used. We chose a hierarchical cluster analysis, namely agglomerative hierarchical clustering. A hierarchical system of clusters is characterized by creating such a decomposition of the original set of objects in which each of the partial decomposition is refinement of the following (i.e. agglomerative clustering) or previous (i.e. divisional clustering) decomposition. Furthermore, agglomerative clustering represents a bottom-up approach. This method iteratively assembles single clusters into larger units. We also tested the *k*-means clustering method, which initially requires determining the number of clusters. This method, however, only confirmed the optimal results of hierarchical clustering. Therefore, we excluded k-means together with the 2-step cluster analysis, which is primarily intended for a large data set.

A set of input data consisted of 9 variables observed in 28 member states of the European Union in the year 2012,

which was the last year with data available for the selected variables in EUROSTAT. However, observing the development trend since 2008, we made a forecast for the year 2014. This has not lead to significant disparities that could affect the division of countries into clusters.

For cluster analysis, we selected the Euclidean distance which is given by:

$$\sqrt{\sum_{i=1}^{n} (X_i - Y_i)^2} \qquad (1)$$

X_i – the value of x for the i-th object
Y_i – the value of y for the i-th object
n – the number of attributes

Ward's method was used. Ward's minimum variance criterion minimizes the total within-cluster variance. At each step, the pair of clusters with the minimum between-cluster distance is merged. The data were standardised before the analysis.

4. Results

The result of the analysis is the creation of the following four clusters:
• Cluster 4: Italy, Spain, Poland;
• Cluster 3: Germany, France, United Kingdom;
• Cluster 2: Bulgaria, Czech Republic, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Portugal, Romania, Slovakia;
• Cluster 1: Belgium, Denmark, Estonia, Ireland, Luxembourg, Netherlands, Austria, Slovenia, Finland and Sweden.

The centres of the clusters are Belgium (1), Hungary (2), France (3), Poland (4). The distance between centres is given in Table 1.

Fig. 1: **Dendrogram of cluster analysis of factors affecting creative industries in the EU**
Source: Author's own processing; XLSTAT

Tab. 1: **Euclidean distances between cluster centres**

Cluster	1	2	3	4
1	0	3,123	5,971	3,990
2	3,123	0	6,851	3,087
3	5,971	6,851	0	4,420
4	3,990	3,087	4,420	0

Source: Author's own processing; XLSTAT

The following dendrograms (Figure 1, Figure 2) show the formation of clusters from top to bottom, i.e. from the level where the agglomerative clusters are most similar to a single unit. Paradoxically, clusters 2 and 4 are closest to each other, followed by cluster 1 and cluster 3.

The best results in the selected factors are obtained in cluster 3, i.e. by Germany, France and the United Kingdom. All the three states have achieved the highest numbers on all indicators. We can conclude that Germany, France and the United Kingdom not only have had the best results according to the macroeconomic indicators, but also have established the most favourable conditions for the development of creative industries. However, we need to take into account the size of the country, especially in case of Germany and France. Germany, followed by the United Kingdom and France, has the best position in the cluster, which indicates the best overall results across the European Union. Taking into account the obtained results we are inclined to claim that the United Kingdom is currently the most important country for the creative industries in the European Union. The analysis of creative industries in the UK was first done in 1998 (DCMS, 1998) [8] and despite the fact that the UK is a world leader in creative industries, in particular with the strong sectors such as design
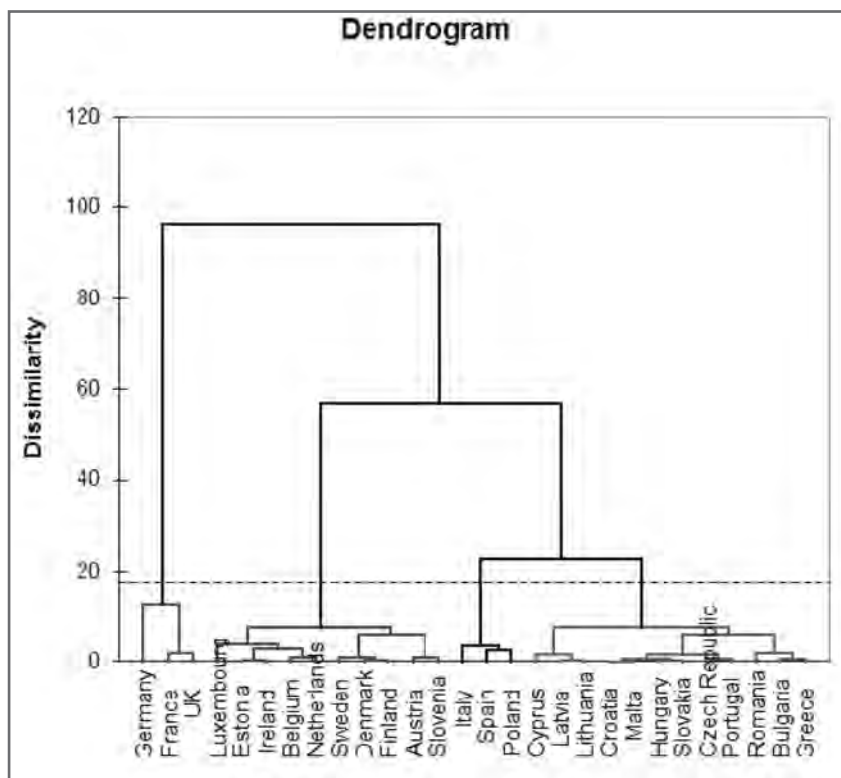
(second place in the world by the size of the sector), fashion, music industry and the publishing industry, the government recognizes that global competition is large and therefore consider it necessary to ensure the continuous development and action plan of the British creative industries. The support of creative industries includes several types of measures (Create UK, 2015) [9] such as:
• promoting entrepreneurship;
• access to funding;
• cooperation between government and the private sector;
• support of education;
• efficient investments;
• infrastructure development;
• intellectual property protection.

Creative industries should receive support at all levels. These together contribute to the creation of favourable environment for further development of the sector.

In both Germany and France, creative industries are recognized and supported at the level of government. In
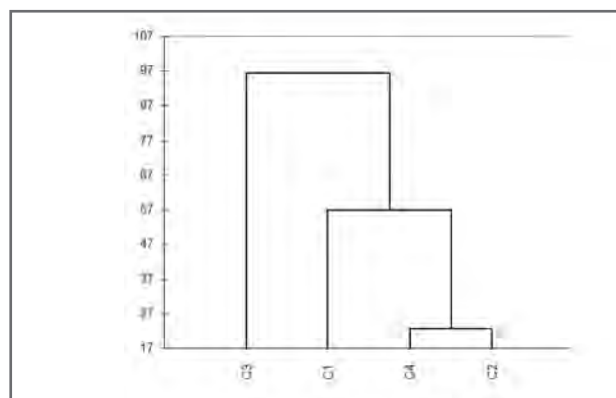

Fig. 2: **Dendrogram of cluster analysis - distances between clusters**
Source: Author's own processing; XLSTAT

Germany, support is more focused on industrial creative activities and innovation, whereas the French approach highlights culture and cultural industries. The culture of France and the French language play a very important role in French cultural and creative industries, which is considered to be national heritage, a purveyor of culture.

The second best score is achieved in cluster 4 by Italy, Spain and Poland. Cluster 4 is quite specific. The countries within the cluster have achieved very similar results, especially Spain and Poland. However, they are quite far to the other clusters. Italy, followed by Spain and Poland, is the best performer within the cluster. The favourable position of Italy is the result of cultural tradition in the country. Similar to France, creative industries in Italy are based on traditional sectors such as art, fashion and design. Thus, creative industries in Italy are a historical phenomenon carrying a new name. Poland was included in this cluster quite unexpectedly. It did not adopt any strategic document to support cultural and creative industries; only platform Creative Poland is active (VOILA, 2013) [10]. But we cannot speak of any strategic support. However, according to Florida's theory, talent, technology and tolerance in Poland are quite positively developed. In addition, Poland also ranks better because of its size.

Cluster 1, which includes Austria, Belgium, Denmark, Estonia, Ireland, Luxembourg, Netherlands, Austria, Slovenia, Finland and Sweden represents the third best score. This cluster reflects the current situation of creative industries in the selected countries. Especially in recent years, almost all the countries in the cluster are trying to actively promote the development of creative industries through government programs, subsidies or other support measures. This is particularly the case of the Nordic countries and the Benelux countries; Austria is a good example, as well. Swedish cultural and creative industries are based on the French approach with an emphasis on their cultural nature. The Government of Sweden have adopted an action plan, which represents the first coherent support in the country (Kulturekonomi, 2014) [11]. Two Swedish academics have become famous and recognized in the field of creative industries studies. They are D. Power and T. Nielsen who have published several papers and contributed to raising popularity of the topic not only in Sweden but also worldwide. Finland started to develop its support strategies ten years ago. Since then, 7 initiatives have been adopted. The emphasis is on two megatrends – education and digitalisation (Baculakova, 2014) [12]. The Benelux countries have also adopted strategic documents. They are focused on national brands and top sectors such as design, art and textile industries. Within the cluster, Belgium, Ireland, Netherlands and Sweden have the best indicators.

Cluster 2, which consists of Bulgaria, Czech Republic, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Portugal, Romania, and Slovakia is the last one. These countries have the lowest score in all indicators. The cluster includes countries where creative industries are generally poorly developed, they are not sufficiently recognized and do not have a comprehensive or government support. However, the Baltic countries, as well as the Czech Republic, have already adopted strategic documents and these countries have a well developed creative cluster (i.e. Republika Uzupis, Creative Brno).

Generally, we can identify some areas and measures, which are common for all strategic support programs in the EU:
• better access to financing;
• support of cooperation between sectors;
• raising awareness of the creative industries;
• support of digitalization;
• support of education, science and innovation;
• protection of cultural heritage;
• international exchange of artists and employees of creative industries;
• internationalization of creative works.

All of these measures are focused on creating better conditions for creative industries.

5. Conclusions

Creative industries are becoming more and more important for the economy of the European Union. Slowly, almost all European countries are adopting strategic documents for their support. Problems occur when the support is only by words. Representatives of creative industries often complain that the topic is not yet recognized and understood in society; it is often confused to be an oxymoron (such as creative accounting), which really harms the sector. As Florida states in his 3T theory, it is not sufficient merely to take steps to finance creative industries or to direct subsidies (even if this is crucial), it is also necessary to create favourable environment for developing of creative industries. This means to support higher education and foreign exchange programs, to create conditions for talent development and to create a good city atmosphere. In fact, the open society is one of the cornerstones of cultural and creative industries.

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