TECHNIUM
SOCIAL SCIENCES JOURNAL

Vol. 32, 2022

A new decade for social changes

ISSN 2668-7798

www.techniumscience.com

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 32, 184-191, June, 2022
ISSN: 2668-7798
www.techniumscience.com

Typologies of sport structures in writing and implementing European Projects: A two-step cluster analysis

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Abstract. In this paper we analyze information about the trends in sports structures in writing and implementing European funds, dividing them into three clusters, using SPSS Two-step Cluster method. When talking about sport structures and their relation with writing and implementing European projects in the field of sport, may not share all the same characteristics. This study aimed to identify typologies of sport structures who engage in writing and implementing European projects. The authors propose a method for a better understanding of the expectations of sports structures in the field of European funds and for managing future participants to European funds trainings effectively. About 433 sport structures completed an online questionnaire. Two-step cluster analysis identified three subgroups, based on projects with non-reimbursable funding that they have benefited from in the last 5 years, type of funding programs (external funds/state budget) and the presence of specialized internal human resources for writing and implementing projects inside their organisation. The largest group contains 222 respondents (53.4%), whose profile shows that they represent sport structures that have never beneficiated from European funds in the last past 5 years (100%), they are not considering hiring new human resources specialized in writing and implementing projects (100%) and don't know a specific funding line / program (72.5%). The second group consists in 104 respondents (25%) – sport structures' representatives that have beneficiated from European funds in the last past 5 years (99%), they are considering hiring new human resources specialized in writing and implementing projects (52.9%) and as a type of funds they are aware of the subsidies provided from the state budget. The third profile gathers 90 respondents, sport structures' representatives that have not beneficiated from European funds in the last past 5 years (98.9%), but they are considering hiring new human resources specialized in writing and implementing projects (100%). Instead, this group doesn't know the funding opportunities that the state or the European Commission provides for Romania. The benefit of the study is reinforcing the sport structures' profits by managing their training in the field of European funds more effectively.

Keywords. Two-step Cluster Analysis, Classify, European funds, training, sport

1. Introduction

The training of human resources in European funds in the field of sport can be a difficult task for some managers of public and private sports organizations as they admitted the lack of a specific skills in this area. This might be the main reason for their inability to attract financial funds provided by the European projects or projects subsidized by the government. In spite of

Technium Social Sciences Journal
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all these, the human resources play a key role for the success of any activity, since these are regarded as a catalyst for efficient standards of management in any industry (Taylor, T. et al. 2015). It is evident that the success of any attempt at sport development is largely dependent upon the ability and competence of the human resources (Chelladurai, P., 2006). Human resources are a rare resource, so carefully planning and selection, training and appropriate rewards and proper integration in the organization, are important requirements for using the resources strategically and efficiently (Brewster, C. 1995, Chirilă, D., 2009).

The specific training of human resources is an important factor for the success of the activities of a company or organization. It allows a theoretical deepening of the reality that will face in professional practice (Beech, J., Chadwick, S., 2004). As well as De Lima, R.C.M. (2008) says, the human resource development includes training activities and continuing education in order to augment the individual's ability to accomplish tasks with efficiency and enthusiasm, giving him/her the opportunity to progress by presenting better operational performance.

A review of human resources management literature clearly revealed that appropriately trained employees were regarded as the major success variable for maintaining standards of service and efficient levels of productivity (Caughron, R., 2000, Chelladurai, P., 2006, Doherty, A.J., 1998, Goslin, A, 1996, Taylor, T. and McGraw, P., 2006). Human resources can only act as a lever force in any industry if properly trained (Buswell, J., 2004, Yang M. and Chen, G.J. 2009).

In this sense, sport entities must understand the need to allocate skilled managers. It is essential an appropriate organizational structure and technical support with the respective qualified human resources and materials (Constantino, J.M., 1999). Attracting, developing and retaining talented people can provide a sport organization with the resources it needs to prosper, grow and, ultimately, gain competitive advantage (Taylor et al. 2015).

In the present paper, we intend to identify the sport structures profiles in the field of European funds, starting with a dataset obtained from an online questionnaire and using Two-step Cluster. The applications that can use clustering algorithms belong to various fields. However, most of these algorithms work with numerical data or categorical data. Nevertheless, data from real world contains both numerical and categorical attributes.

2. Cluster analysis method

Cluster analysis, also called segmentation analysis or taxonomy analysis, is an exploratory analysis that tries to identify structures within the data. More specifically, it tries to identify homogenous groups of cases if the grouping is not previously known. Because it is exploratory, it does not make any distinction between dependent and independent variables. The different cluster analysis methods that SPSS offers can handle binary, nominal, ordinal, and scale (interval or ratio) data. Cluster analysis is often used in conjunction with other analyses (such as discriminant analysis). The researcher must be able to interpret the cluster analysis based on their understanding of the data to determine if the results produced by the analysis are actually meaningful (Statistic Solutions, 2022).

Unlike many other statistical methods, cluster analysis is typically used when there is no assumption made about the likely relationships within the data. It provides information about where associations and patterns in data exist, but not what those might be or what they mean (QUALTRICS, 2022).

TwoStep Cluster is an SPSS method which solves this problem. This method has the advantage of determining the proper number of clusters, so the aim is to find this number of

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profiles, for managing the existing and the possible participants to European funds trainings effectively. In the following sections, we introduce the TwoStep Cluster method and our case study with inputs, outputs and the interpretation of the results.

Two-step cluster analysis identifies groupings by running pre-clustering first and then by running hierarchical methods. Because it uses a quick cluster algorithm upfront, it can handle large data sets that would take a long time to compute with hierarchical cluster methods. In this respect, it is a combination of the previous two approaches. Two-step clustering can handle scale and ordinal data in the same model, and it automatically selects the number of clusters.

The two-step cluster analysis aims at forming homogeneous clusters of statistical units and predicting the classification of new individuals into one of these clusters. The grouping of statistical units into homogeneous clusters is done progressively, depending on the distance between them. For the calculation of the distance between the statistical units we used the log-likelihood distance because the variables used are of a qualitative nature. A statistical unit will be classified into a cluster for which the lo-likelihood distance is greatest (Pintilescu, C., 2007).

TwoStep Cluster involves performing the following steps:

- pre-clustering;
- solving atypical values (outliers) - optional;
- clustering. (Șchiopu, D., 2010)

The optimal number of clusters in which we grouped the statistical units was based on the calculation of the average Silhouette coefficient and the Akaike information criterion (AIK).

3. Research methodology

Since TwoStep Cluster is often preferred first for large datasets and second for handling mixture data, we applied this method using some data referring to the sport structures' representatives for clustering this data.

3.1. Research questions

Our initial questions for this study were:

- What homogenous clusters emerge based on a standardized questionnaire about writing and implementing European funds?
- What measure of inter-subject similarity is to be used and how is each variable to be "weighted" in the construction of such a summary measure?
- After inter-subject similarities are obtained, how are the classes to be formed?
- After the classes have been formed, what summary measures of each cluster are appropriate in a descriptive sense; that is, how are the clusters to be defined?
- Assuming that adequate descriptions of the clusters can be obtained, what inferences can be drawn regarding their statistical significance?

3.2. Research methods

Over 400 respondents – representatives of federations, private and public clubs, NGOs, sport universities participated to a survey that aimed at identifying: the existing status of knowledge and previous experience of key groups of subordinated entities of the Ministry of Youth and Sports (county sports and youth directorates, federations, sports clubs, sports complexes, sports research institutes); the degree to which there is a specialized internal human resource for drafting and implementing projects from non-reimbursable funds, the degree of interest for requesting future funds in the period 2021-2027; the need for improved knowledge

Technium Social Sciences Journal
Vol. 32, 184-191, June, 2022
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www.techniumscience.com

and professional skills in the domain of European funds; attitudes towards training; willingness to participate in training.

For the realization of different profiles, we analyze the following patterns: The type of sports structure they are part of, position within the organization, projects with non-reimbursable funding in the last 5 years, funding line / programs they beneficiated from, the existence of specialized internal human resources for writing and implementing projects, the intention for applying for funds in the context of the new programmatic period 2021 – 2027, the intention to hire new human resources specialized in writing and implementing projects, the intention to participate in training courses in order to learn how to attract European funds, the programs that they know/want to access for the period 2021-2027.

The dataset that has been used for our research has been obtained from an online questionnaire. The dataset has 433 records which contain information about: Organisation (ORG), Position (POS), Projects (PROJ), Type of Funds (TYPE), Human resources (HR), New human resources employed (New_HR), Interest in Training courses (TRAIN), Submission of applications (SUBMIT), Operational Programs Knowledge (OP_KNOW). All this information is constituted in the 9 qualitative variables used in the classification.

3.3. Results

Applying the Two-Step cluster analysis, using the approach presented above, we obtain results on the composition of clusters, results on descriptive analysis of variables, evaluation of the accuracy of the classification model and the results of classification of statistical units on clusters (Pintilescu, C., 2007). The interpretation of the obtained results concerns the classification, the importance of the variables in the formation of the clusters and the prediction of the classification of new statistical units.

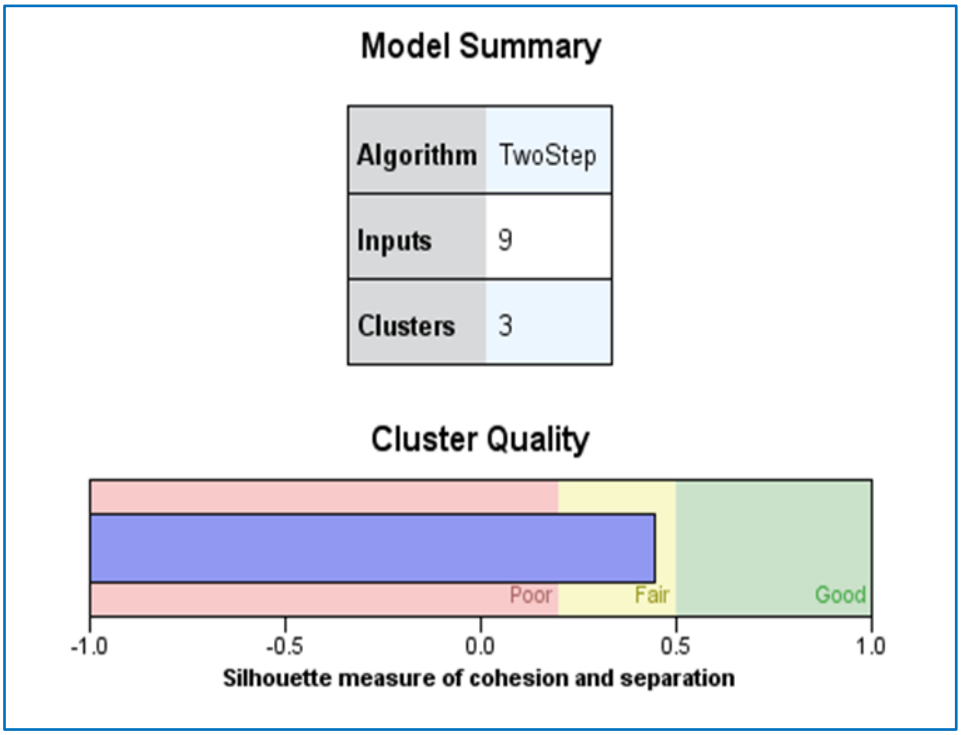

Figure 1 Silhouette coefficient - evaluation of the model accuracy

Technium Social Sciences Journal
Vol. 32, 184-191, June, 2022
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The results of the evaluation of the model accuracy by the average of the Silhouette coefficients shown in Figure 1 indicate that the model obtained is close to 0.5, which shows that the grouping model achieves an adequate separation of units on clusters.

Cluster composition results show the number of statistical units in each cluster. The analyzed sample, consisting of 416 people was grouped into 3 clusters: the first cluster consists of 104 units (25% of the total number), the second cluster consists of 90 people (21.65% of the total number) and the third cluster consists of 222 people (53.4% of the total number).

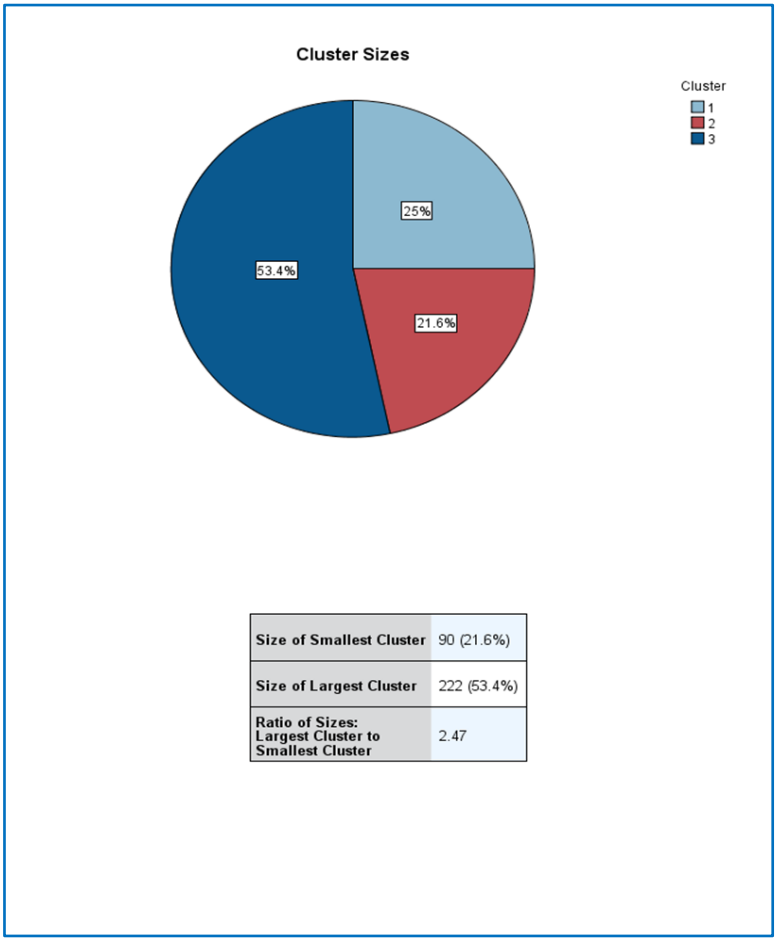

Figure 2 Classification results

The coefficients of importance of the variables in the grouping of units on clusters and their hierarchy are shown in Figure 3. As we can see the importance of the categorical variables for the three clusters are the same. Note that Projects (Were there any projects with non-reimbursable funding that you have benefited from in the last 5 years?), Type of Funds (If yes, please specify the funding line / program) Human resources (Do you have specialized internal human resources for writing and implementing projects from grants?) contribute the most to differentiating all the clusters.

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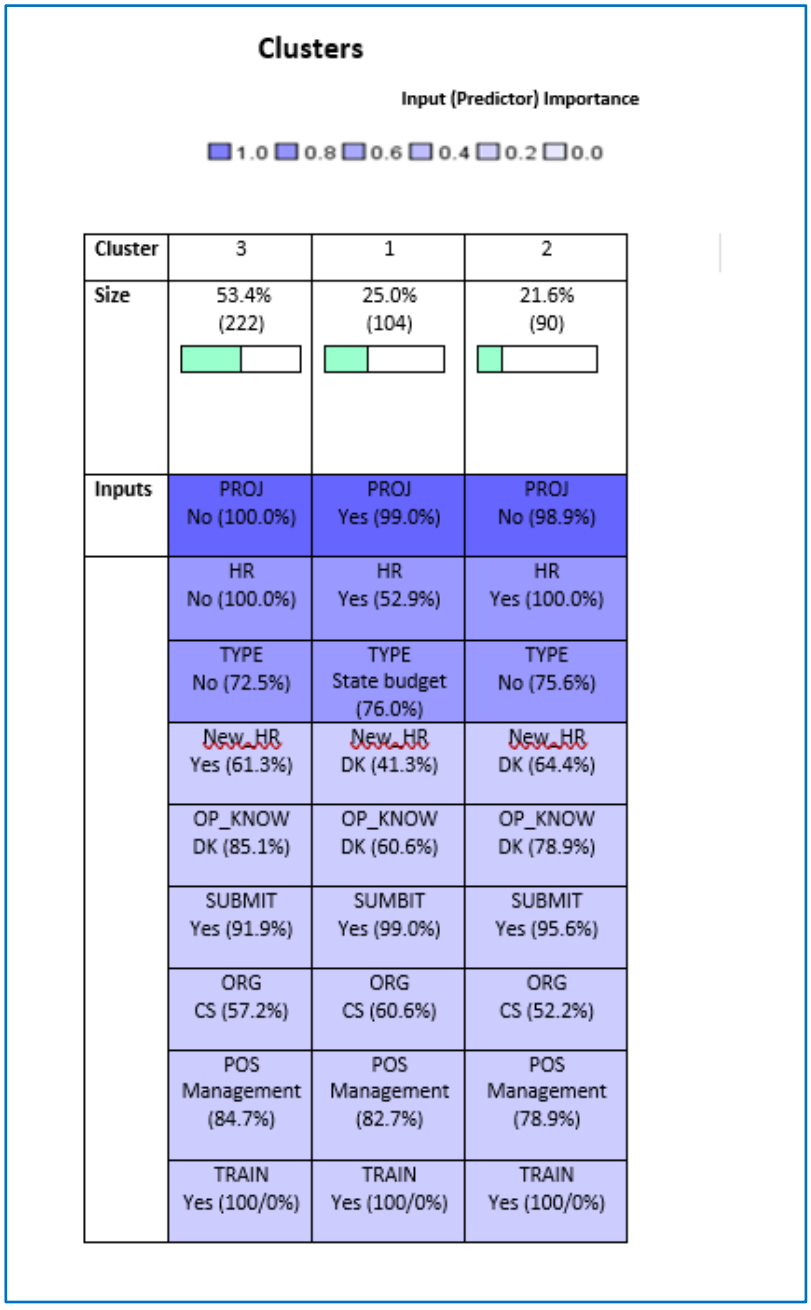

Cluster	3	1	2
Size	53.4% (222)	25.0% (104)	21.6% (90)
Inputs	PROJ No (100.0%)	PROJ Yes (99.0%)	PROJ No (98.9%)
	HR No (100.0%)	HR Yes (52.9%)	HR Yes (100.0%)
	TYPE No (72.5%)	TYPE State budget (76.0%)	TYPE No (75.6%)
	New_HR Yes (61.3%)	New_HR DK (41.3%)	New_HR DK (64.4%)
	OP_KNOW DK (85.1%)	OP_KNOW DK (60.6%)	OP_KNOW DK (78.9%)
	SUBMIT Yes (91.9%)	SUMBIT Yes (99.0%)	SUBMIT Yes (95.6%)
	ORG CS (57.2%)	ORG CS (60.6%)	ORG CS (52.2%)
	POS Management (84.7%)	POS Management (82.7%)	POS Management (78.9%)
	TRAIN Yes (100/0%)	TRAIN Yes (100/0%)	TRAIN Yes (100/0%)

Table 3 Hierarchy of importance of group variables

4. Discussion

We present the following conclusions after the results provided by TwoStep Cluster.

The largest group contains 222 respondents (53.4%), whose profile shows that they represent sport structures that have never beneficiated from European funds in the last past 5 years (100%), they are not considering hiring new human resources specialized in writing and implementing projects (100%) and don't know a specific funding line / program (72.5%).

The second group consists in 104 respondents (25%) – sport structures' representatives that have beneficiated from European funds in the last past 5 years (99%), they are considering

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hiring new human resources specialized in writing and implementing projects (52.9%) and as a type of funds they are aware of the subsidies provided from the state budget.

The third profile gathers 90 respondents, sport structures' representatives that have not beneficiated from European funds in the last past 5 years (98.9%), but they are considering hiring new human resources specialized in writing and implementing projects (100%). Instead, this group doesn't know the funding opportunities that the state or the European Commission provides for Romania.

The most important cluster is the first. This is the largest cluster (53.4%) containing sport structures that have never beneficiated from European funds in the last past 5 years (100%), they are not considering hiring new human resources specialized in writing and implementing projects (100%) and don't know a specific funding line / program (72.5%).

5. Conclusions

Clustering methods can be applied in various fields which use large datasets, just to find hidden patterns. We showed that TwoStep method can be easily used, which also determines the optimal number of clusters automatically. Applying this method to our data, we identified three sport structures' profiles. The most important profile contains sport structures that have never beneficiated from European funds in the last past 5 years (100%), they are not considering hiring new human resources specialized in writing and implementing projects (100%) and don't know a specific funding line / program (72.5%).

The training of human resources in European funds in the field of sport can be a difficult task for some managers of public and private sports organizations as they admitted the lack of a specific skills in this area. This might be the main reason for their inability to attract financial funds provided by the European projects or projects subsidized by the government. In spite of all these, the human resources play a key role for the success of any activity, since these are regarded as a catalyst for efficient standards of management in any industry in Taylor's terms. It is evident that the success of any attempt at sport development is largely dependent upon the ability and competence of the human resources.

The benefit of the study is reinforcing the sport structures' profits by managing their future training in the field of European funds more effectively.

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