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ASSESSING THE DEVELOPMENT OF CULTURAL INSTITUTIONS IN POLAND – A MULTIDIMENSIONAL COMPARATIVE ANALYSIS

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Purpose: The main goal of this paper is to assess the development of cultural institutions in Poland. It examines the application of selected statistical methods which have not been applied as yet for the purpose of ranking cultural institutions. To achieve this goal we identified the most appropriate variables which, in our opinion were the most adequate to describe the development of cultural institutions. We used selected linear ordering procedures and processed statistical data on cultural institutions in Poland.
Design/methodology/approach: Based on the review of literature on the role of cultural institutions in a broader socio-economic landscape the authors present the application of three statistical methods: Perkal, Hellwig and TOPSIS.
Findings: The study managed to review the development of musical cultural institutions in terms of the analysis of the spatial differentiation factor. We demonstrated how the three selected methods of statistical analysis can be used for ranking cultural institutions. Thus, we contributed to the research on the measurement of challenges posed by the intangible nature of creative industries.
Originality/value: In the study, linear ordering methods were used to assess the development of musical cultural institutions, which had not previously been used to create rankings of cultural institutions. No such application of statistical methods was applied so far to rank cultural institutions within the context of the creative sectors development.

Keywords: cultural institutions, creative sectors, multidimensional comparative analysis, measurement of output in cultural institutions.

Category of the paper: an empirical study.

Introduction

„Culture is universally recognized as a driving force for economic and social development, for sustainability as well as for developing a sense of belonging to a common space such as that of Europe" (European Union, 2022). According to UNESCO, culture is a vehicle for economic

development (UNESCO, 2010) but also a vehicle for environmental stability and resilient communities. Not surprisingly culture has its contribution to the economic development. Therefore, the development of cultural institutions can and should be a subject of economic studies, especially that the role and share of creative sectors in overall economic activities is growing in virtually all developed countries. For example, in Poland in 2018 creative economy was responsible for 6.3% of economic value added, 15% of economic growth in Poland in the earth 20/15/2018 can be attributed to the creative economy (Bąkowska et. al, 2020).

There has been a growing need in the Creative and Cultural Industries (CCI) sector to prove their 'worth' by demonstrating efficiency and effectiveness in economic or other fields in society. Cultural institutions are a specific type of organisation whose aim is to preserve, interpret and disseminate cultural, scientific, and environmental knowledge, and promote activities meant to inform and educate citizens on associated aspects of culture, history, science and the environment. The most popular cultural institutions are museums, libraries, historical or botanical societies, and community cultural centres. A cultural institution or cultural organization is an organization within a culture/subculture that works for the preservation or promotion of culture (Amruta, 2023). Cultural institutions are characterised by an acknowledged mission which makes them distinct from other organizations within the creative sectors. Their contribution is measured to large extend by intangible factors such as their contribution to the conservation, interpretation and dissemination of cultural, scientific, and environmental knowledge. Cultural institutions are play an important role in prompting cultural understanding, intercultural dialogue and cultural diversity, and in the transmission of culture across generations. According to Krajewski (2021) cultural institutions are a product of modernization processes that sprouted in the eighteenth century and matured after World War Two. Cultural institution, especially according the European tradition are supposed to be financed mainly from the public, rather than private funds (Krajewski, 2021).

Research problem

We focused our research on the issue which has been present in the literature for several decades, namely: „How to value cultural institutions or activities?". The question of economic contribution to the economy became a focal point of the neoliberal economic thinking (see for example: Myerscough 1988). At present, there is a tendency to consider the value of culture as something quite more complex and holistic, particularly the social aspects, which cannot be reduced to a monetary form (Alberti, 2021).

As in many other countries, the spatial distribution of cultural institutions in Poland is uneven. The chief authorities responsible for organizing cultural activities at regional level are voivodships (NTS-3) in Poland, due to the current distribution of powers between the three

levels of local governments. Cultural institutions strive to increase number of consumers of their offerings, often on competitive basis with other cultural institutions. We narrowed down the scope of our study only to musical institutions. The aim of our paper is to identify the most appropriate variables which are the most adequate to describe the development of cultural institutions. In order to achieve that goal we will use selected linear ordering procedures and process statistical data on cultural institutions in Poland. We used three methods of linear ordering, namely: Perkal, Hellwig and the TOPSIS linear ordering method.

We were able to identify some publications related to the financing of cultural institutions in Poland, e.g. the GUS Report on methodological work (GUS, Satellite Culture Account or Culture Statistics Report. Methodological notebook). However, there is still a research gap in the field of research on the statistical analysis of development with particular emphasis on musical cultural institutions, which is why the scope of our study narrows the broad area of research on cultural institutions to music institutions.

Research approach

Cultural institutions, and in a broader sense, cultural industries are characterised by a platheora of variables including spatial distribution, economic performance and financing (both from public and private sources), artistic performance, creativity assessment etc. Additionally, the diversity of forms of artistic expression (music, theatre, dance, poetry, painting - to name just a few) makes all comparisons a challenging research task. We decided to apply some multidimensional statistical methods to provide some more evidence on how to rank cultural institutions. The most adequate seem to be taxonomic methods, the linear ordering method in particular. The linear ordering methods measures sets of statistical data – objects or phenomena described by numerous variables. The application of a synthetic index allows to identify the variance of a spatially diversified factor. Linear ordering methods are used to classify multi-attribute objects are useful for prioritisation – ranking of regions, institutions, organisations or products.

The Perkal, Hellwig and TOPSIS linear ordering methods allow for comparisons of selected indices and obtaining a synthetic measure for describing the regional development. The Hellwig method uses a benchmark as a point of reference in a multidimensional space. The TOPSIS method uses two points of reference: a positive benchmark and a negative benchmark. When applying the linear ordering methods the following steps have to be followed (Bąk, 2016):

1. choose the appropriate variables,
2. determine the role of the variables: stimulants, destimulants or nominants,
3. attribute weights to variables,

4. normalise the variables,
5. in the case of (benchmark aggregation) set the index for the benchmark indicator,
6. perform benchmark or non- benchmark aggregation,
7. conduct qualittive assessment of the data set and develop synthetic variables.

Data collection

We selected data from the Polish Statistical Office (GUS), Bank of Local Data (BDL). We used data from 2018 due to our pre-set condition that we would investigate the phenomenon before the outbreak of the COVID-19 pandemic as 2018 was the most recent year of a stable and undisturbed full year when musical institutions could function within the traditional mode.

We selected 12 variables characterising musical institutions and theatres and two variables characterising the population of each voivodship in 2018 (Table 1).

Table 1.
Variables characterising the development of cultural institutions

Symbol	Variable name	Unit	Year
X1	Music institutions - units - philharmonic	quantity	2018
X2	Music institutions - performers / concert (at fixed room) - philharmonic	quantity	2018
X3	Music institutions - audiences / learners (at fixed room) - philharmonic	person	2018
X4	Music institutions - units - symphony orchestra and chamber	quantity	2018
X5	Music institutions - performers / concert (at fixed room) - symphony orchestra and chamber	quantity	2018
X6	Music institutions - audiences / learners (at fixed room) - symphony orchestra and chamber	person	2018
X7	Theatres - units - entertaining musical theater, operetta - theater, dance, ballet, musical	quantity	2018
X8	Theatres - performances in fixed theater halls - performances - entertaining musical theater, operetta - theater, dance, ballet, musical	quantity	2018
X9	Theatres - performances in fixed theater halls - audience - entertaining musical theater, operetta - theater, dance, ballet, musical	person	2018
X10	Theatres - units - opera theater	quantity	2018
X11	Theatres - performances in fixed theater halls - performances - opera theater	quantity	2018
X12	Theatres - performances in fixed theater halls - audience - opera theater	person	2018
X13	Number of inhabitants in voivodeships	person	2018
X14	Number of inhabitants in voivodeships per 100,000 people	person	2018

Source: GUS-BDL: https://bdl.stat.gov.pl/bdl/dane/podgrup/wymiary, 21 February 2023.

After initial calculation and analysis the variance indicator was calculated. The number of variables was reduced to 5 through combining the variables characterising of musical institutions with opera theatres due to the error in the GUS data which did not classify one cultural institution (Opera nd Philharmony in Białystok) as a musical institution but as a opera theatre showing „zero" for the number of concerts and participants in Podlaskie Voivodship which is not correct because the institution organises both opera performances and a symphonic

concerts. The GUS data only reveal the Cameral Philparmony in Łomża (Filharmonia Kameralna im. Witolda Lutosławskiego w Łomży), which should belong to the musical institutions indicator – „symphony orchestra and chamber". The selected variables are indicated in Table 2.

Table 2.
Variables selected for the study

X1	Music institutions - units - philharmonic and opera theater	quantity	2018
X2	Music institutions - performers / concert (at fixed room) - philharmonic and opera theater	quantity	2018
X3	Music institutions - audiences / learners (at fixed room) - philharmonic and opera theater	person	2018
X4	Music institutions - units - symphony orchestra and chamber	quantity	2018
X5	Music institutions - performers / concert (at fixed room) - symphony orchestra and chamber	quantity	2018

Source: GUS-BDL: https://bdl.stat.gov.pl/bdl/dane/podgrup/wymiary, 21.02.2023.

When selecting variables one has to calculate the arythmetical average, standard deviation and most importantly, the variance indicator. Which plays the key role in determining the variance of variables. The calculated variance indicator is above 45%, which indicates a strong variance of variables. Data presented in relative units are included in Table 3.

Table 3.
Data in relative unit

Voivodeship	**X1**	**X2**	**X3**	**X4**	**X4**
dolnośląskie	0.137809999	22.08405239	9587.269388	0	0
kujawsko-pomorskie	0.096017944	12.4823327	6324.26988	0.048008972	2.784520371
lubelskie	0.047029676	6.113857905	2570.877249	0.047029676	1.834157372
lubuskie	0.196689325	28.51995217	6247.541383	0	0
łódzkie	0.080765169	9.651437721	6924.240252	0	0
małopolskie	0.058973043	9.936957817	4294.210616	0.088459565	2.919165649
mazowieckie	0.074285692	8.189997543	6786.59225	0.074285692	1.652856647
opolskie	0.101003061	13.73641635	5312.054008	0	0
podkarpackie	0.046967364	4.274030147	1786.779438	0	0
podlaskie	0.168840773	37.82033316	9489.780068	0	0
pomorskie	0.129073839	25.6426694	11234.4579	0.086049226	0.688393809
śląskie	0.087947267	13.96162861	3534.578667	0.087947267	8.640818965
świętokrzyskie	0.080145416	9.938031564	2637.425345	0	0
warmińsko-mazurskie	0.069737682	12.62252039	4424.298003	0.069737682	0
wielkopolskie	0.085979348	9.486388036	3941.780518	0.028659783	0.171958696
zachodnio-pomorskie	0.175898092	29.49224671	11361.08184	0	0
average	0.102322731	15.87205329	6028.5773	0.033136116	1.168241969
standard deviation	0.05	9.764498494	3052.993454	0.037519767	2.246504389
coefficient of variation	45.17%	61.52%	50.64%	113.23%	192.30%

Source: own elaboration.

The next step in our research procedure was to to develop a matrix of the Pearson linear coorelation coefficients (Table 4).

Table 4.
Pearson linear correlation coefficient matrix

	X1	**X2**	**X3**	**X4**	**X5**
X1	1	0.933546611	0.739884673	-0.404602	-0.257146405
X2	0.933546611	1	0.782997822	-0.264626256	-0.207389325
X3	0.739884673	0.782997822	1	-0.109761938	-0.26880222
X4	-0.404602	-0.264626256	-0.109761938	1	0.637239684
X5	-0.257146405	-0.207389325	-0.26880222	0.637239684	1

Source: own elaboration.

At the conclusion of the variables selection process one needs to calculate a reverse matrix to the Pearsons correlation matrix so that the elements on the main diagonal of the reverse matrix are lower than the assumed critical value of 10 (Table 5).

Table 5.
Matrix inverse of Pearson's linear correlation coefficient matrix

	X1	**X2**	**X3**	**X4**	**X5**
X1	10	-8.397034681	-1.119200265	2.468953392	-0.934683901
X2	-8.397034681	9.7792964	-1.524215245	-1.0645156	0.137493549
X3	-1.119200265	-1.524215245	3.156205209	-1.120588192	0.958573937
X4	2.468953392	-1.0645156	-1.120588192	2.56312329	-1.520427154
X5	-0.934683901	0.137493549	0.958573937	-1.520427154	2.014707411

Source: own elaboration.

In the study, despite the value on the main diagonal equal to 10, the X1 variable was left for substantive reasons. The selection of variables allows the analysis of data using linear ordering methods.

The Perkal method involves the development of a synthetic index combining a sum of standarised partial indicators and includes the following stages:

Stage I: Determining the character of variables (stimulant/destimulant).

Stage II: Standardisation - converting destimulants into stimulants (1).

$$z_{ij} = \frac{x_{ij}-\bar{x}_j}{sj} \text{ for stimulant}$$
$$z_{ij} = -\frac{x_{ij}-\bar{x}_j}{sj} \text{ for destimulant} \quad (1)$$

Stage III. Determining the synthetic index (2):

$$WP = \frac{1}{n}\sum_{i=1}^{n} z_{ij} \quad (2)$$

where:

WP – value Perkal,

n – number of objects,

z_{ij} – standardized value *j* variable in the object *i*,

Stage IV. Then you need to rank the objects (Table 6).

Table 6.
Voivodeship ranking

Voivodeship	WP	Rank
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16

Source: own elaboration.

Stage V. The last stage of the Perkal method is the classification of objects presented in Table 7).

Table 7.
Classification of the level of development

Classes	Development level	Formula
I	Very high	WP > average + standard deviation
II	High	average ≤ WP < average - standard deviation
III	Low	average - standard deviation ≤ WP < average
IV	Very low	WP < average - standard deviation

Source: own elaboration.

The Hellwig linear ordering method involves the development of a synthetic indicator combining the sum of partial standardized indicators. Here, the point of reference for objects in multidimensional space is a benchmark. The method was popularized in the field of taxonomic research in 1968 as the first method of linear ordering for measuring the economic development (Bak, 2016). Similar to the Perkal method, the Hellwig method involves several stages:

Stage I: Determining the type of variable: a stymulant/destimulatn and determining the maximum and minimum values of objects.

Stage II. Standarization – z_{ij} and determining a coordinating benchmark– z_{0j}

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{Sj} \tag{3}$$

$$z_{0j} = \begin{Bmatrix} max_i\{z_{ij}\}\, for\ stimulant\ variables \\ min_i\{z_{ij}\}\, for\ destimulant\ variables \end{Bmatrix}$$

Stage III. Determining the distance between the objects and the benchmark:

$$d_{i0} = \sqrt{\sum_{j=1}^{m} (z_{ij} - z_{0j})^2} \tag{4}$$

Stage IV. Determining the synthetic indicator:

$$q_i = 1 - \frac{d_{i0}}{d_0} \; synthetic\ indicator$$

$$\bar{d}_0 = \frac{1}{n}\sum_{i=1}^{n} d_{i0} \; average\ distance\ from\ the\ benchmark \tag{5}$$

$$s_d = \sqrt{\sum_{i=1}^{n} (d_{i0} - \bar{d}_0)^2} \; standard\ deviation$$

$d_0 = \bar{d}_0 + 2s_d$ *the sum of the average distance and the double standard deviation*

Stage V. Ranking the objects.

Stage VI. Classifying the objects– as in the Perkal method.

The TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution) – supports decision-makers in ordering multi-criteria options. The method was developed and published by Ching-Lai Hwang and Kwangsun Yoona (Hwang, Yoona, 1981) in a paper on multicriteria decision-making.

The TOPSIS method involves the development of a synthetic indicator combining the sum of partial standarised indicators. The method uses two points of reference, the so called ideal solution and the anti-benchmark as the reference points for decisions (Hwang, Yoon, 1981).

The methods involves six stages:

Stage I. Determining the type of variable: a stymulant/destimulatn and determining the maximum and minimum values of objects – as in the Hellwig method.

Stage II. Normalising variables (6):

$$z_{ik} = \frac{x_{ik} - \min\limits_{i}\{x_{ik}\}}{\max\limits_{i}\{x_{ik}\} - \min\limits_{i}\{x_{ik}\}} \; for\ stimulant$$

$$z_{ik} = \frac{\max\limits_{i}\{x_{ik}\} - x_{ik}}{\max\limits_{i}\{x_{ik}\} - \min\limits_{i}\{x_{ik}\}} \; for\ destimulant \tag{6}$$

where:

k – indicator number (k = 1, 2, …, m),

i – voivodeships number (k = 1, 2, …, 16),

$\max\limits_{i}\{x_{ik}\}$ – maximum value of the k-index,

$\min\limits_{i}\{x_{ik}\}$ – minimum value of the k-index.

Stage III. Determining the Euclidean distance of objects from the points of reference (7).

$$d_i^+ = \sqrt{\sum (z_{ik} - z_{ik}^+)^2}$$
$$d_i^- = \sqrt{\sum (z_{ik} - z_{ik}^-)^2} \quad (7)$$

where:

$z_{ik}^+ = (1,1, \dots, 1)$ – positive benchmark of development,

$z_{ik}^- = (0,0, \dots, 0)$ – negative benchmark of development,

k = 1, 2, …, m; I = 1, 2, … n.

Stage IV. Determining the synthetic indicator (8).

$$q_i = \frac{d_i^-}{d_i^- + d_i^+} \textit{ synthetic indicator} \quad (8)$$

Etap V. Facility ranking.

Etap VI. Classification of objects - as in the Perkal method.

Results and discussion

As shown in table 3. the application of each of the 3 methods reveals a different order of Polish regions depending on the ranking method applied (Table 9).

Table 9.
Voivodeship ranking

Voivodeship	Rank Perkal	Rank Hellwig	Rank TOPSIS
dolnośląskie	6	7	6
kujawsko-pomorskie	7	5	9
lubelskie	14	14	13
lubuskie	5	6	5
łódzkie	12	13	12
małopolskie	9	9	7
mazowieckie	8	8	8
opolskie	11	11	11
podkarpackie	16	16	16
podlaskie	3	3	3
pomorskie	1	1	1
śląskie	2	2	2
świętokrzyskie	15	15	15
warmińsko-mazurskie	10	10	10
wielkopolskie	13	12	14
zachodniopomorskie	4	4	4

Source: own elaboration.

The results obtained by applying the Perkal method are presented in Table 10.

Table 10.
Method classification of Perkal

Voivodeship	WP	Classes
pomorskie	0.896261081	I
śląskie	0.692713939	I
podlaskie	0.68351489	I
zachodniopomorskie	0.66606476	I
lubuskie	0.401139211	II
dolnośląskie	0.23329854	II
kujawsko-pomorskie	0.145829873	II
mazowieckie	0.033472045	II
małopolskie	0.028003466	II
warmińsko-mazurskie	-0.221566203	III
opolskie	-0.377031026	III
łódzkie	-0.442667656	III
wielkopolskie	-0.450782475	III
lubelskie	-0.532320851	III
świętokrzyskie	-0.720306535	IV
podkarpackie	-1.035623057	IV

Source: own elaboration.

Research results in the application of the Hellwig method (Table 11).

Table 11.
Method classification of Hellwig

Voivodeship	q_i	Classes
pomorskie	0.443173763	I
śląskie	0.412367182	I
podlaskie	0.365281002	II
zachodniopomorskie	0.362413275	II
kujawsko-pomorskie	0.3494308	II
lubuskie	0.322010619	II
dolnośląskie	0.310206382	II
mazowieckie	0.2649545	II
małopolskie	0.257299496	II
warmińsko-mazurskie	0.189277514	III
opolskie	0.186477596	III
wielkopolskie	0.161424293	III
łódzkie	0.158433392	III
lubelskie	0.1289813	III
świętokrzyskie	0.093403478	IV
podkarpackie	-0.001258085	IV

Source: own elaboration.

Test results using the TOPSIS method are presented in Table 12.

Table 12.
Method classification of TOPSIS

Voivodeship	qi	Classes
pomorskie	0.598620893	I
śląskie	0.530935771	I
podlaskie	0.513534451	II
zachodniopomorskie	0.512871854	II
lubuskie	0.461826188	II
dolnośląskie	0.424786842	II
małopolskie	0.410061815	II
mazowieckie	0.401604757	II
kujawsko-pomorskie	0.387888588	II
warmińsko-mazurskie	0.343705662	III
opolskie	0.243795833	III
łódzkie	0.243489912	III
lubelskie	0.235011535	III
wielkopolskie	0.215735444	III
świętokrzyskie	0.125829485	IV
podkarpackie	0	IV

Source: own elaboration.

To compare the results the Spearman co-relation index was used. With the values close to 1.00 for each variance a strong interdependence is present. The strongest correlation is observed between the Perkal and the Hellwig methods (Table 13).

Table 13.
Spearman's rank correlation

Perkal Rank	**Rank Hellwig**	0,988235294
Perkal Rank	**Rank TOPSIS**	0,985294118
Hellwig Rank	**Rank TOPSIS**	0,958823529

Source: own elaboration.

According to the Perkal and Hellwig rankings, Pomorskie and Śląskie regions score high in the ranking of musical institutions in Poland. The former scores high with the highest number of spectators in another philharmonic and theatre operas. This result may be explained by a large number of tourist resorts in the region providing seasonal participants including tourists and patients who participate in cultural offering as a part of their leisure time. The Śląskie region has more cultural institutions then the Pomorskie region including such prominent institutions as the Silesian Philharmonya in Katowice and Silesian Opera in Bytom, Zabrze Philharmony in Zabrze, Częstochowa Philharmony in Częstochowa as well as many renowned symphonic and chamber orchestras: NOSPR – Polish Radio National Symphonic Orchestra in Katowicach, Zespół Pieśni i Tańca „Śląsk". The key success factor for the Śląsk region is nick character of NOSPR. The new modern facilities draw attract art lovers not only music fans but also lovers of architecture. According to Yasuhis Toyota the popularity of cultural institutions can we explain when at visitor is able to see there's something which he will never see anywhere else in the world" (Siedziba NOSPR).

The following seven regions which scored high in the a ranking of cultural institution development include: Podlaskie, Zachodniopomorskie, Kujawsko-pomorskie, Lubuskie, Dolnośląskie, Mazowieckie and Małopolskie. The oldest opera and philharmonic theatresin Poland are located in those regions as well as those who received their high status more recently such as Szczecin Philharmony and the National Forum of Music in Wrocław.

The low and very low level of development was achieved by those regions were the number of spectators in a permanent stage is compared to the number of inhabitants. The explanation can be different income levels in Polish regions, with Eastern Poland being substantially poorer then the West of the country. In 2018 the lowest disposable income in Poland was in Podkarpackie region, located in the South east of the country - PLN 1347. A similar situation can be observed in other Eastern Poland regions such as: Świętokrzyskie and Lubuskie. Low income levels exclude many people from accessing cultural goods which usually our positions on top of the Maslow pyramid of needs. A smaller number of culture introductions in a given region for example in Świetokrzyskie or Podkarpackie can be explained also by a smaller number of performances and concerts (in a permanent hall) or in an opera cross theatre. Geographical networks connecting big cities with other metropolitan centres allow for easier access 2 cultural institutions located in other regions. Such opportunities are limited to ever inhabitants of smaller towns and cities which will have a smaller selection of metropolitan areas and the cultural institutions then the inhabitants of larger metropolitan areas. On the other hand, the inhabitants of Eastern Polish regions might have relatively easy access to the council institutions in the neighbouring metropolitan areas such as Warsaw or Kraków. Unfortunately there is no data available regarding the geographical origin of the spectators in specific cultural institutions in Poland. Another factor impacting the consumption of cultural services in Poland is that the artistic seasons in musical institutions in Poland start on the 1st of September and finish on the 31st of August the following year. There is only a limited number of events and performances organised during the holiday. Such timetable may have negative impact on the participation in culture in Poland as most of the cultural institutions in Poland are closed during the holiday.

Summary

By analysing the results of the application of that three linear ordering methods, namely the Perkal, the Hellwig and the TOPSIS methods for the purpose of measuring of development of cultural institutions certain findings can be observed. There is a co-relation between the number of cultural institutions in Poland and the variety of offerings. A more diversified offer of cultural institutions co-exists with access a better access to musical institutions which in turn results in increased the number of spectators. It has to be emphasised that the development of musical

cultural institutions is not only explained by the offering of Philharmonic operas and musical theatres but also very diversified. The architecture of the facilities also has an positive impact on the number of spectators. Good examples illustrating the architecture of some prominent Polish cultural institutions include the NOSPR in Katowice and the Philharmony in Szczecin.

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