# Economic Impact Calculator: Do It Yourself!

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## Abstract

Economic Impact studies have been a common tool in cultural advocacy for decades. However, it is not usually obvious how the study results were calculated, what methodology was used and what the numbers reflect. Consequently, such studies of various cultural projects cannot be compared, and their readers (often policy-makers) look on the results suspiciously, as they do not believe or understand them. The most accurate and sophisticated studies of economic impacts worldwide are based on input-output analysis and multiplying effect, but it is very demanding to calculate all multipliers and impacts for a single report.

All these problems can be solved by a computer model which is available online to the public. Such a model enables organizations and policy-makers easily to obtain impacts of a number of projects. The results can be compared by means of very accurate and clear methodology.

The article explains all the necessary steps for building such a calculator of the economic impacts of visitor expenditure, such as defining and collecting input data from visitors, calculating input-output multipliers and coefficients from the State official statistics, generating a project's direct and indirect impacts on total production, gross value added, employment (job creation), employees' income, profit of businesses and tax collection and, finally, interpreting the results.

The whole procedure is explained on a new tool [www.culcal.cz](www.culcal.cz) (CULture CALculator) developed in the Czech Republic (Central Europe), financed by the Ministry of Culture and realized by both local and foreign researchers and consultants. The web-based application can be viewed and used by anybody who wants to discover his or her own project's economic impacts on the local economy. The model has already been employed and tested in economic impact studies of significant international music and theatre events in Central Europe (Prague Quadrennial, Prague Spring, Smetana Litomysl, etc.).

The authors were inspired by similar models used in other countries, such as the EIMAH (Economic Impact Model of Arts and Heritage) and the TREIM (Tourism Regional Economic Impact Model) in Canada. The article explains how such models function and how they can be used internationally.

**Keywords:**

economic impact, input-output analysis, multipliers, culture calculator, statistical model

# Contents

# 1    Measuring economic impacts of culture

Economic impact studies have been a common tool in cultural advocacy for decades. Culture and tourism influence the whole community. And their costs and gains relate in some form to everyone in the particular destination. Studies focused on economic impacts provide quantified estimates of these mutual relations and assist in the understanding of the influence of culture and tourism on regions.

A study of economic impacts can be elaborated for any destination, institution or activity. However, it is very popular especially with cultural organizations. Above all, it helps to enhance the importance of the particular organization or field of culture in the eyes of other fields, as well as of potential sponsors and also of the public. Consequently, the economic results support political decisions on behalf of tourism and cultural development. (Raabová *et al*., 2013)

Studies of economic impacts are often elaborated for cultural organizations that attract a lot of visitors, i.e. organizations that influence tourism and destination management.  Sometimes also municipalities or regions that want to know the economic importance of cultural activities in their area are among the submitters.

## 2 The most accurate method: visitor survey and input-output analysis

There are several methods of measuring economic impacts. The input-output analysis, invented by Wassily Leontief (Nobel Prize-winner in 1973), is considered the most accurate and sophisticated among the methods for calculation of economic impacts of an institution, activity or project (Stynes, 1997).

This analysis is based on tables of use and supply, known as **input-output tables,** published by statistical offices of the particular country. Input-output tables show the structure of the country's entire production system for a particular period (usually one year). They show the value of goods and services produced by each industry and who purchases them (e.g. some goods, such as cars, are mainly sold to final consumers, while others, such as steel, are used as input to other industries in producing more goods and services).

Thus, input-output tables show the relationships that exist between industries. From these tables, it is possible to determine what types of inputs, such as raw materials, manufactured goods and labour, are used by any industry. By setting out the links amongst different industries, input-output tables are a representation of the structure of the economy. (Australian Government, 2001)

The input-output model can serve as a tool to calculate **input-output multipliers**. Input-output multipliers are summary measures used for predicting the total impact on all industries in an economy (including multiplied effects coming from the whole supply chain) of changes in the demand for the output of any one industry (e.g. culture). They describe average effects, not marginal effects, and thus do not take into account the economies of scale, unused capacity or technological change.

With these multipliers, the direct and indirect impacts of a new investment and its influence on regional economic indexes can be quantified:

- total output (production),
- gross value added,
- employment (number of jobs created),
- employees' incomes,
- companies' profits.

**Required input information** for calculating the economic impact of visitor attendance of a cultural project are data on the volume and structure of expenditure by visitors during their visits (the best source is a visitor survey organized during the project).

The exploited data are linked up on multipliers of production, GDP, employment rate and employees' compensation for individual industries.
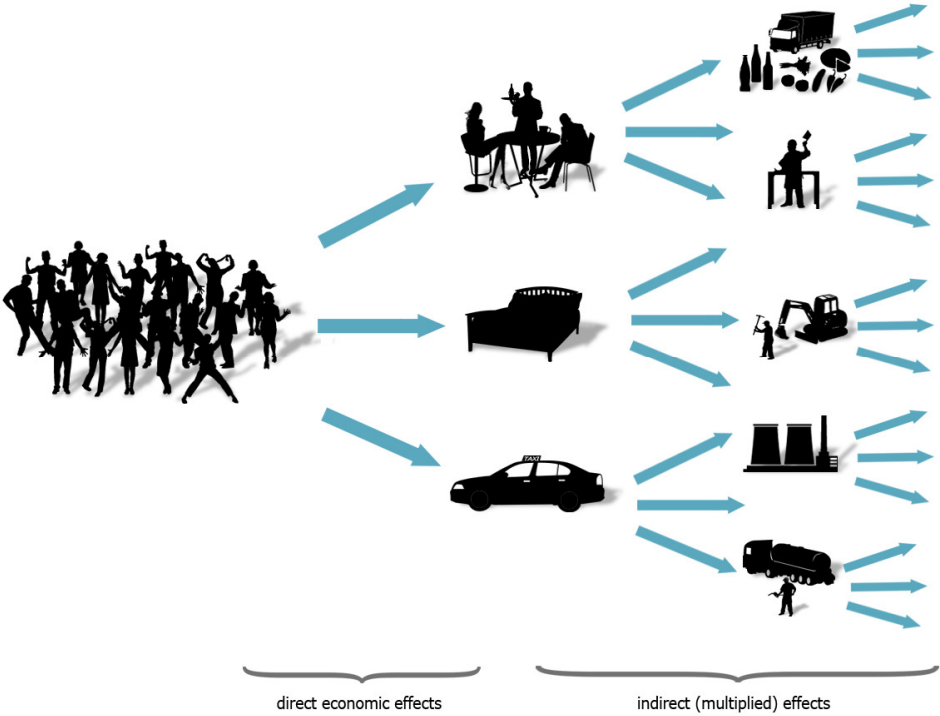
There are various definitions of direct and indirect impacts. Most authors (e.g. Stynes, Heilburn and Gray, Whiting, Australian Government) use the following terminology:

**Direct effects** – the changes in the economy that are caused by the direct expenses of a cultural organization or their visitors (e.g. production growth of the direct suppliers of products and services demanded by visitors or the organization itself).

**Indirect effects** – the changes in the economy that are caused by subsequent suppliers' production as a consequence of further related economic activity in the analysed region (direct suppliers demand goods and services from their sub-suppliers and these sub-suppliers demand other goods and services from their own sub-suppliers). So, this can be understood as the changes that involve all other production activities as a result of the relations between direct suppliers and their subcontractors in the local economy.

Both direct and indirect effects are well demonstrated in Figure 1.

Figure 1    Direct and indirect impacts of increase in visitors' spending (Raabová, 2011)



direct economic effects          indirect (multiplied) effects

# 3    Creating an economic impact calculator

In many economic impact studies for cultural projects, it is not clear how the results were calculated, what methodology was used and what the numbers reflect. Consequently, such studies of various cultural projects cannot be compared, and their readers (often policy-makers) look on the results suspiciously, as they do not believe or understand them. The most accurate and sophisticated studies of economic impacts worldwide are based on input-output analysis and multiplying effect (as explained above), but it is very demanding to calculate all multipliers and impacts for a single report.

All these problems can be solved by a computer model, which is available online to the public. Such a model enables organizations and policy-makers easily to obtain impacts of a number of projects. The results of several projects can be compared and the methodology is very accurate and clear.

In this paper, I explain all the necessary steps for building such a calculator of economic impacts of visitor expenditure:

Defining input data from visitors

Calculating input-output coefficients and multipliers

Matching input data from visitors with I-O multipliers

Calculating direct and indirect impacts

Interpretation of results

All steps were applied while creating the CulCal.cz online calculator, the methodology of which has been proved in several economic impact studies for significant international festivals in the Czech Republic (see below).

## 3.1    Defining input data from visitors

The first important step is to collect input data from visitors. For this purpose, it is usually necessary to organize a visitor survey during the examined cultural event.

The following input data must be known:

1. **Total number of unique visitors**

   Usually, the attendance number is known from the ticketing evidence. However, it is very important for the total number of unique visitors, not the number of tickets sold, to be known. Consequently, the relationship between these two figures must be known. For

example, a festival visitor can buy 3 or 4 tickets for different concerts within the festival; a museum visitor can enter a museum more than once during the examined period.

To obtain this information, it is possible to implement a question in the questionnaire such as: "How many concerts do you plan to visit/have you visited during the festival?"

2. **Where the visitors came from**

It is necessary to ask visitors where they have come from. This provides the knowledge of how many people came from the local area and how many from other regions or from abroad. Leading on from this, the amount of money brought by them to the town or city can be ascertained.

In addition, for purposes of marketing, fundraising, audience development, etc., it is always very important to know where the audience came from.

3. **How much money the visitors spent and on what**

The structure and quantity of visitor expenditure are the most important data needed for the input-output analysis. The expenditure categories should be set up according to input-output table categories (multipliers), so that they can be linked afterwards.

Example: expenditure categories for non-local visitors used in the CulCal.cz online application:

**Transport expenditures related to the visit of event:**
> Car - purchase of gas
> Car - parking expenditures
> Buses, public transport, taxi
> Train
> Other

**Other expenditures:**
> Entrance fee (tickets)
> Restaurants, bars, vendors
> Food in stores
> Accommodation
> Related purchase of souvenirs and other items
> Related purchase of clothes, jewellery, shoes, etc.
> Tour guides, tour operators, etc.
> Other

4. **How the visitor expenditures were related to the cultural project**

The relevance of the visitor expenditures must be ascertained, because sometimes the visitors' money would have been spent in that area in any case, even without the cultural project. For some visitors, the cultural event is the main reason for coming to the

destination (so the influence of the event on their arrival and expenditures is high). Other visitors come for different reasons and decide to attend the event only after arrival at the destination and noticing that the event is taking place there (in this case, the most expenditures at the destination are unrelated to the event).

Several methods may be used to discover the motivation of visitors for coming and the money spent at the destination (Whiting, 2004; Raabová, 2010, 2013). For example, non-local visitors can be asked the following questions:

1. How important was the event for your decision to visit the town / city?
   Not at all .................................. Main reason for coming
        0  1  2  3  4  5  6  7  8  9  10

This method enables the expenditures to be divided between event-related and the rest. The related expenditures equals the total expenditures multiplied by the rate of importance (for example, if a visitor checked 10 = the event was the main reason for coming, 100% of his/her expenditures are calculated as related to the event; in the case of  5 being checked = the event was one of two main reasons of equal importance, 50% of his/her expenditures are calculated).

2. What is the final destination of your journey?
   This question supports the above question and assists in understanding visitor's motivation for coming to the region or the city.

## 3.2    Calculating input-output coefficients and multipliers

As already mentioned, multipliers and direct impact coefficients are derived from input-output tables. The tables are regularly presented by statistical offices all over the world, as a standard part of national accounts. Ask or search for the latest symmetrical input-output table (SIOT) at your statistical office to calculate the multipliers. A simple model of an input-output table is presented in Figure 2.

Figure 2    Simple structure of Australian input-output tables (McLennan, 1995)

**FIGURE 3. STRUCTURE OF AUSTRALIAN INPUT-OUTPUT TABLES**
Indirect allocation of imports, Basic values, Recording of intra-industry flows

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| To / From | Row prefix | | *Intermediate Demand* | | | | | Intermediate usage (sub-total) | | *Final Demand* | | | | | | | Final Demand (sub-total) | Total supply (grand total) |
| | | *Agriculture, etc* | *Mining* | *Manufacturing, etc* | *Construction* | *Services* | | Final consumption expenditure —private | Final consumption expenditure —government | Gross fixed capital expenditure —private | Gross fixed capital expenditure —public enterprises | Gross fixed capital expenditure —general government | Increase in stocks | Net exports of goods and services | | |
| Column prefix | | 01.01-04.00 | 11.01-16.00 | 21.01-37.01 | 41.01-41.02 | 47.01-93.01 | | Q1 | Q2 | Q3 | Q4 | Q5 | Q 6 | Q 7 | | |
| Agriculture | 01.01-04.00 | | | | | | | | | | | | | | | |
| Mining | 11.01-16.00 | QUADRANT 1 | | | | | | QUADRANT 2 | | | | | | | | |
| Manufacturing, etc. | 21.01-37.01 | INTERMEDIATE USAGE | | | | | | FINAL DEMAND | | | | | | | | |
| Construction | 41.01-41.02 | | | | | | | | | | | | | | | |
| Services | 47.01-93.01 | | | | | | | | | | | | | | | |
| Intermediate inputs (sub-total) | | | | | | | | | | | | | | | | |
| Wages, salaries and supplements | P1 | | | | | | | | | | | | | | | |
| Gross operating surplus | P2 | | | | | | | | | | | | | | | |
| Commodity taxes (net) | P3 | QUADRANT 3 | | | | | | QUADRANT 4 | | | | | | | | |
| Indirect taxes n.e.c. (net) | P4 | PRIMARY INPUTS TO PRODUCTION | | | | | | PRIMARY INPUTS TO FINAL DEMAND | | | | | | | | |
| Sales by final buyers | P5 | | | | | | | | | | | | | | | |
| Australian production | | | | | | | | | | | | | | | | |

The shaded areas correspond to aggregates shown in the National production account.

⬚ corresponds to aggregates shown as the components of 'gross domestic product' at market prices.

⬚ corresponds to aggregates shown as the components of 'expenditure on gross domestic product'.

The aim of this paper is not to explain the complex input-output analysis and calculation of multipliers (for this, please, consult any textbook concerning the topic, e.g. Leontief, 1951; Miler and Blair, 1985; McLennan, 1995, etc.). Nevertheless, the basic process of the calculation of direct effect coefficients and multipliers is mentioned below.

## Direct effect coefficients

The initial requirement for an extra dollar's (or other monetary unit) worth of output of a given industry is called the *initial output effect*. By definition, it is equal to one in total for all industries, since an additional dollar's worth of output from any industry will require the initial one dollar's worth of output from that industry, plus any induced extra output. The first-round effect is the amount of output required from all industries of the economy to produce the initial output effect. Let us suppose that the output of the Construction industry is increased by one dollar. Then inputs from other industries, such as Manufacturing and Mining, will be required, as well as inputs from the Construction industry itself. The demand for the extra dollar's worth of Construction output is regarded as having caused the production of these outputs. The Construction industry is said to have 'backwards linkages' to the industries supplying its inputs.

The first-round effect can be measured quite simply by deriving another table from the flow (SIOT) table, by dividing each of its columns by the total production of that industry (the column total) to produce a table of coefficients (which measure the strength of the backwards linkages). The result is the ***Direct Requirements Table***. (McLennan, 1995)

From the rows of this table, all direct effects coefficients needed to calculate **direct economic impacts** can be read:

1. Output coefficients = last row, i. e. for any industry always 1 (100%)
2. Gross Value Added coef. = row Gross Value Added
3. Employees' Income coef. = row Wages, Salaries and Supplements
4. Employment coef. – Employment coefficients are calculated by dividing the number of employed persons in a given industry ($FTE_i$ – full-time equivalent employment for industry *i*, taken from another source of the local statistical office) by the level of total production generated by that industry ($O_i$, taken from the original SIOT):

$$e = \frac{FTE_i}{O_i}$$

   N.B.: The Employment coefficients and multipliers relate to an extra $1 million of output. To incorporate the Employment coefficient into the matrix calculations, the Employment coefficients for all industries must be transposed to give a vector.

5. Analogously, one can also work with other rows and indexes presented in the input-output tables (Gross Operating Surplus, Taxes, Imports, etc.)

## Input-output multipliers

### Output Multipliers

To calculate Output Multipliers, the first quadrant rows and columns of the Direct Requirements Table (i.e. all industry or product categories) are taken and form the *A* matrix (also referred to as the Intermediate Usage Matrix). A matrix *I* of the same number of rows and columns as the *A* matrix is set up, with all its diagonal elements equal to 1 and all its other elements equal to zero and a new matrix *(I - A)* is calculated. Then the Matrix Inversion function is called (available on spreadsheet programs, such as MS Excel and all statistical programs) to calculate the **Leontief Inverse Matrix** *(I - A)⁻¹*.

*Leontief Inverse Matrix:*     $L = (I - A)^{-1}$

The column totals are then formed. These are the required **Output Multipliers**. An Output Multiplier shows the relationship between the initial increase in output required from an industry and the total increase in output by all industries.

Example: If the Output Multiplier for the Mining industry is 1.53, it shows that $1.53 of extra output from the whole national economy is induced by an additional output of $1.00 in the Mining industry. In other words, to produce an additional unit of output in Mining, apart from Mining's additional unit of output, the economy's output must increase by an additional $0.53 in order to provide inputs to Mining. The effects encompassed by the total multiplier are the initial effects (in any case, $1.00), the first-round effects due to direct expenses of Mining for inputs (in our example it is $0.32) and the industrial support effects generated by all the sub-suppliers (in our example $0.21 = total multiplier – initial effect – first-round effect).

Note that this multiplier involves double-counting, as the increased output of one industry can be used as an input into another industry and so can be counted more than once. For this reason, this multiplier must be used with care as it overstates the economic impact resulting from the initial increase in output (caused, for example, by a new cultural project). (McLennan, 1995; Australian Government, 2001)

The problem of double-counting can be avoided by using a Gross Value Added Multiplier (the gross value added by an industry excludes the value of goods and services provided by other industries that is used in producing the output).

## Gross Value Added Multipliers

The Gross Value Added Multiplier shows the relationship between the initial increase in output required from an industry and the total increase in gross value added by all industries.

The rise in gross value added corresponds to a rise in gross domestic product (GDP), since the GDP includes GVA plus net taxes:

**GDP**    **= GVA + Net taxes =**

      **= (Output – Intermediate inputs) + (Taxes – Subsidies on products)**

To calculate GVA multipliers, the vector ***h*** from the *Direct Requirements Table* (the row called Gross Value Added) is needed, which represents the initial effect on the increase of gross value added (generated by direct increase in output by 1 monetary unit).

Thereafter, this vector is multiplied by the Leontief Inverse Matrix:

*Gross Value Added Multipliers = $h * (I\text{-}A)^{-1}$*

## Income Multipliers

The Income Multiplier for a given industry is defined as the total value of income from wages, salaries and supplements required to satisfy a dollar's (or other unit's) worth of final demand for the output of that industry. The household coefficients in the Wages, Salaries and Supplements row of the *Direct Requirements Table* have already been calculated – these are the direct income effects. For simplicity, they are referred to as the vector *$i$*.

The Income Multipliers can be calculated using the Matrix Multiplication function of a spreadsheet package as follows:

*Income Multipliers = $i * (I - A)^{-1}$*

Since the wages, salaries and supplements are one part of gross value added, the Income Multipliers will be lower than the Gross Value Added Multipliers.

## Employment Multipliers

The Employment Multiplier shows the number of extra persons employed (or jobs created) for an initial expenditure of $1 million in output from an industry. It is expressed in full-time equivalent (FTE), which supposes the ideal flexibility in the labour market where new workers are immediately available for full-time employment. FTE expresses the number of new full-time jobs created for the following 12 months, so it redistributes and converts seasonal and part-time jobs to permanent full-time jobs.

Employment Multipliers can be obtained by using the row vector of Employment coefficients, *$e$*, instead of vector *$h$* or *$i$*. We have already explained that the Employment coefficients are calculated by dividing the number of employed persons in a given industry by the level of production generated by that industry. Usually, Employment Multipliers relate to an extra $1 million of output. To incorporate the Employment coefficient into the matrix calculations, the Employment coefficients are transposed to give a vector.

*Employment Multipliers = $e * (I\text{-}A)^{-1}$*

### Other Multipliers

Analogously, multipliers for other rows and indexes in the input-output tables (Gross Operating Surplus, Taxes, Imports, etc.) can be calculated.

## 3.3 Matching input data from visitors with I-O multipliers

Once all coefficients and multipliers have been calculated and all necessary input data from visitors have been collected, they can be matched in order to calculate the economic impacts of visitors. In the first step, the visitor data have to be purged and adjusted for subsequent calculations.

### Adjusting visitor data

The rough visitor data collected in the survey include final expenditures by visitors, so they include all the taxes and margins paid by visitors. However, for the input-output analysis, net expenditures are needed, which correspond to the real increase in visitors' demand for products and services.

To obtain the net expenditures, the data need to be purged from:
1) Value Added Tax and other taxes on products;
2) retail margins for products bought in stores (the average margins for all types of products can also usually be obtained from local statistical offices). Thereafter, the deducted margins can be matched to the multipliers of retail industry. The raw price of the product should be matched to multipliers of the relevant production industry.

### Matching net visitor data to coefficients and multipliers

In this phase, every visitor spending category must be linked to an input-output category (multiplier). For example, visitor expenditures in a hotel should be matched to input-output multipliers for accommodation services (NACE 55).

In the case of a visitor expenditure category being able to be matched to more input-output (multiplier) categories, it is recommended that all relevant multipliers are aggregated into one. To aggregate them, the average of the relevant industry multipliers, weighted by the total production of the industries in question, is calculated. (Raabová, 2011)

## 3.4    Calculating direct and indirect impacts and interpreting the results

At this point, each item of visitor expenditures can simply be multiplied by the coefficient and multiplier of the relevant industry.

Case study: Visitors to Prague Quadrennial 2011 spent approximately $2.5 million (approx. 50 000 Czech crowns) on accommodation services. The VAT on accommodation services was 10%. Therefore, after tax deduction, the net increase in demand for accommodation services was $2.27 million. Thereafter, this number can be multiplied by all the calculated coefficients and multipliers of the accommodation industry:

Direct effects on production: 2.27 m * 1 = $2.27 m

Total effects on production (net expenditures * output multiplier for accommodation industry in the Czech Republic): 2.27 * 1.7492 = $3.97 m

Direct effects on gross value added (net expenditures * GVA direct effect coef. for accommodation industry in the Czech Rep.): 2.27 m * 0.3266 = $ 0.7414 m

Total effects on gross value added (net expenditures * GVA multiplier for accommodation industry in the Czech Rep.): $2.27 m * 0.5738 = $1.3025 m

etc.

In the following section, the process of the calculation of total visitor economic impacts for different indexes is carried out, as well as their interpretation, which is very important (as we are not satisfied with the common phrase: "The event generates economic impacts of xxxx million USD." This phrase has no meaning or possible interpretation).

### Impacts on production (output)

The output effects (calculated by Output Multipliers) show the total increase of domestic production (output) of products and services, implied by the initial change in demand for a certain product. Production means the sum of sales in the case of commercial subjects, or the sum of the costs in the case of non-commercial subjects[1]. This means that this indicator also includes the value of intermediate consumption, wages and salaries, profit margins and other inputs.

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[1]    Economic subjects are considered as non-commercial if their sales revenues are less than 50% of their total income.

**Direct impact on production ($O_d$) of visitors' spending** is equal to the sum of visitors' spending purged from taxes and margins ($s_v$) for all products and services paid for by all visitors as a result of the event. This is only the initial increase in output of final products and services directly consumed by visitors to the event.

$$O_d = \sum s_v$$

**Total impact on production ($O$) of visitors' spending** can be obtained by multiplying all of visitors' spending ($s_v$ - each category, such as accommodation, restaurants, gas, etc.) by its Output Multiplier ($mo$) and all these products are summed up:

$$O = \sum s_v \times mo$$

This indicator presents the total increase in output of all domestic economy. It includes both direct increase in output of final products and services consumed by visitors and indirect increase in output of intermediate consumption realized by suppliers and the whole production chain.

**Indirect impact on production $O_i$ of visitors' spending** is calculated as the difference between total impact and direct impact on production:

$$O_i = O - O_d$$

Indirect increase in production is the output of intermediate products and services needed to produce the final products consumed by visitors. The output of all levels of the production chain, except the output of final products, is counted.

### Impact on gross value added

As already mentioned, the gross value added indicator (GVA) bears a relation to the gross domestic product (GDP), as the difference is only in net taxes on production. This is the reason for assuming that an increase in GVA roughly corresponds to an increase in GDP. The impact on an increase in GVA only includes the added value of products and services, i.e. it does

not include the value of intermediate consumption. In input-output tables, the GVA is usually calculated by the income method, so it includes employees' compensation (wages and salaries), net taxes on production, net operating surplus, mixed income and consumption of fixed capital.

**Direct impact on increase in gross value added** $H_d$ can be obtained by multiplying all of visitors' spending ($s_v$ - each category, such as accommodation, restaurants, gas, etc.) by its direct coefficient for GVA ($h$) and all these products are summed up:
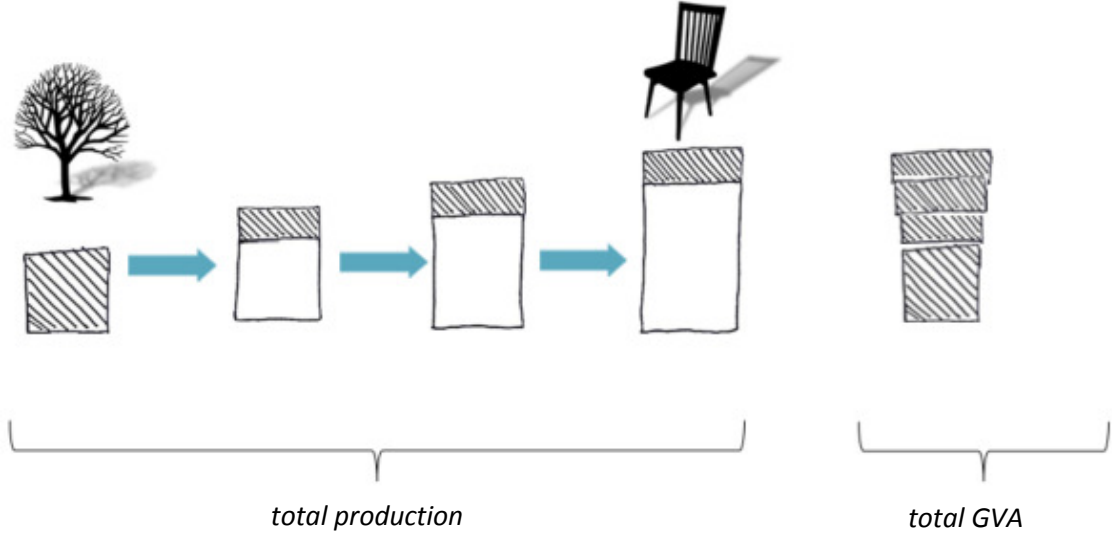
$$H_d = \sum s_v \times h$$

This indicator shows the increase in gross value added in the economy, due to the initial increase in output of the final products and services paid for by visitors. It differs from the initial increase of output by the value of intermediate consumption, so it excludes double-counting.

**Total impact on increase in gross value added** $H$ can be obtained by multiplying all of visitors' spending ($s_v$) by its GVA multiplier ($mh$) and then all these products are summed up:

$$H = \sum s_v \times mh$$

This indicator shows a total increase in gross value added (or GDP) in the whole economy, caused by the increase in production of both final and intermediate products and services for visitors. Contrary to the total impact on production, this indicator excludes double-counting, because it counts only the added value to inputs on every production chain level. Therefore, the value of intermediate inputs is always counted only once (if it is part of the added value at the same time).

Figure 3   Difference between total impact on production (output) and total impact on GVA
        (Raabová, 2011; www.culcal.cz)



total production                           total GVA

**Indirect impact of visitors' spending on gross value added $H_i$** is calculated as the difference between total impact and direct impact on GVA:

$$H_i = H - H_d$$

Indirect increase in GVA includes values added to products on all levels of the production chain, except the final round.

### Impact on employees' income

Compensation of employees is one part of gross value added. It integrates wages, salaries and social compensation of employees. It is usually published in gross value, i.e. before tax and insurance deductions. For better comprehension, the term 'employees' income' is used as synonymous with the compensation of employees.

**Direct impact of visitors' spending on employees' income $I_d$** can be obtained if we multiply all of visitors' spending ($s_v$) by its direct coefficient for income ($i$). All these products are then summed up:

$$I_d = \sum s_v \times i$$

A direct increase in the compensation of employees indicates how much money (from the money spent by visitors on final products and services) was used to cover the labour costs of employees in hotels, restaurants, stores, etc.

**Total impact on increase in employees' income** *I* can be obtained by multiplying all of visitors' spending ($s_v$) by its income multiplier (*mi*). All these products are then summed up:

$$I = \sum s_v \times mi$$

Total impact on employees' income includes the increase in gross wages and salaries of employees on all levels of the production chain.

**Indirect impact of visitors' spending on employees' income** $I_i$ is calculated as the difference between the total impact and direct impact on employees' income:

$$I_i = I - I_d$$

Indirect increase in employees' income includes gross wages and salaries of employees working for all suppliers of intermediate products, i.e. on all levels of the production chain, except the final round.

## Impact on employment

New visitors' spending and a higher demand for certain products and services imply an increase in output and obviously also more people needed to be employed to produce this output. The number of new jobs corresponds to the increase in output by 1 million in a monetary unit (e.g. dollar) and is always presented as full-time employment, meaning the number of full-time permanent (12-month) jobs.

Note that businesses may respond to an increase in demand in a number of ways. For example, for short-term events, businesses may not take on extra staff, but cater for the change in demand by paying overtime. Thus, even though full-time equivalent (FTE) employment (as measured by the Employment Multiplier) increases, the actual number employed may remain relatively unchanged. Similarly, if businesses respond to the change in demand by employing

part-time workers, the actual number employed may not change the total number of new jobs created, as some of these employees may have other jobs elsewhere.

**Direct impact on employment $E_d$** can be obtained by multiplying all of visitors' spending ($s_v$) by its direct coefficient for employment ($e$). All these products are then summed up:

$$E_d = \sum s_v \times e$$

Direct impact on employment shows how many jobs were created in hotels, restaurants, stores, etc. in order to satisfy the higher demand for final products and services worth $1 million (or other currency).

**Total impact on employment $E$** is obtained by multiplying all of visitors' spending ($s_v$) by its employment multiplier ($me$). All these products are then summed up:

$$E = \sum s_v \times me$$

Total impact on employment includes new jobs created on all levels of the production chain (expressed in the full-time equivalent).

**Indirect impact on employment $E_i$** is calculated as the difference between total impact and direct impact on employment:

$$E_i = E - E_d$$

Indirect impact on employment consists of the number of jobs created (in FTE) by suppliers of intermediate products, meaning on all levels of the production chain, except the final round.

# 4 Practical application: www.culcal.cz

The model as explained above has already been employed and tested in economic impact studies of significant international music and theatre events in Central Europe (Prague Quadrennial of Scenography and Theatre Design, International Music Festivals such as Prague Spring, Smetana Litomysl, Cesky Krumlov, etc.), as well as of several sporting events (Prague Marathon). The published studies have evoked interest among other cultural organizations and also researchers and students in the Czech Republic. However, these persons could not afford to order a similar study involving a costly survey and the demanding calculation of multipliers.

At that time, the author of the model (and this paper) was already aware of several models which serve to calculate economic impacts online, such as EIMAH (Economic Impact Model for Arts and Heritage) and TREIM (Tourism Regional Economic Impact Model) in Canada. It was agreed with the Arts Institute, a Czech budgetary organization, to have the methodology certified by the Ministry of Culture and to build a similar model in the Czech Republic. The main aim was to spread knowledge and enlightenment on the economic impacts of culture, and to provide cultural organizations with an advocacy tool for their work and for dealing with partners both from the public and private spheres. The methodology was officially certified and the project was financed by the Ministry of Culture as part of the mapping of cultural and creative industries in the Czech Republic. It was realized by the Arts and Theatre Institute with the aid of many local and foreign researchers and consultants.

In January 2014, the www.culcal.cz (CULture CALculator) online application was launched. This may be viewed and used by anybody wanting to discover his or her own project's economic impacts on the local economy. In the first few months online, this application was utilized by hundreds of users who entered thousands of project scenarios.

# 5    What is its purpose?

Elaboration of the study of economic impacts can be beneficial not only for an organization itself, but also for its sponsors, grantors and subsidy providers.

**Managers of cultural organizations** can use such a study for an evaluation of their organization's economic importance. It can also be used as an attachment for a project submission when requesting subsidies, grants or sponsor contributions. Donors are currently more likely to support organizations which can persuade them of their efficiency and ability to generate new capital for a region.

**The authorities that provide subsidies, grants or donations** can merit from these studies in their decision making. If all major organizations, or at least organizations applying for subsidies, have their economic impact studies elaborated, it would simplify the evaluation of the subsidy requests. Therefore it should be one of the criteria in subsidy policies. However, economic success and efficiency can naturally not be the only criteria in subsidy policies for cultural projects. The most important factors are the intrinsic social values of culture that are difficult or impossible to quantify.

Another benefit of the studies is their exploitability by the  S**tate and local authorities** that usually decide on strategies for tourism and culture. For example, with the aid of visitor surveys, authorities can find important information on visitors' commercial behaviour, the length of their stays, etc. This information can be used for economic predictions in connection with the bodies' decisions, as well as in the planning of regional tourism development. (Raabová, 2010)

An online model such as www.culcal.cz can facilitate organizations and policy-makers to ascertain the impacts of a number of projects easily. Results can be compared with the very accurate and clear methodology. In the case of the Czech www.CulCal.cz, the Arts Institute patronage and certification by the Ministry of Culture give the results higher esteem in the eyes of local authorities and other partners of cultural organizations.

# Literature and sources

Australian Government. 2001. Multipliers for Culture-Related Industries. Australian Government – Department of Communication, IT and the Arts, 2001.

Cross, P., Ghanem, Z. 2006. Multipliers and Outsourcing: How industries interact with each other and affect GDP. Canadian Economic Observer. Statistics Canada – Catalogue no. 11-010. Ottawa, January 2006.

Cultural Calculator. Website: <www.culcal.cz>

Czech Statistical Office. Website: <www.czso.cz>

Eurostat. 2002. The ESA 95 Input-Output Manual: Compilation and Analysis. Eurostat, 2002.

Frechtling, Douglas C. 1994. Assessing the economic impacts of travel and tourism – Introduction to travel economic impact estimation. In. Travel, Tourism and Hospitality Research, second edition. J.R. Brent Ritchie and Charles R. Goeldner (eds.). New York: John Wiley and Sons Inc.

Government of Canada, Department of Canadian Heritage. 2008. Economic Impact Model for Arts and Heritage. <http://dev.rcip-chin.gc.ca/mieap-eimah/>

Heilbrun, J., Gray, C. M. 2001. The Economics of Art and Culture. 2nd ed. New York : Cambridge University Press, 2001. ISBN 978-0-521-63712-1

Jurajda, Š., Lízal, L., Münich, D., Zemčík, P. 2006. Hlavní ekonomické důsledky pořádání letních olympijských her v Praze v roce 2016. Praha: Národohospodářský ústav Akademie věd ČR, 2006.

KEA. 2006. Economics of Culture in Europe. KEA (European Affairs), prepared for European Commission, 2006.

Leontief, W. 1951. Input-Output Economics. Scientific American, 1951, no. 4, pp. 15–21.

McLennan, W. 1995. Information Paper: Australian National Accounts: Introduction to Input-Output Multipliers. Australian Bureau of Statistics, Catalogue No. 5246.0.

Miller, R., Blair, P. 1985. Input-output Analysis: Foundations and Extensions. Prentice-Hall, New Jersey 1985. ISBN 0-13-466715-8 01.

Raabová, T. 2010. Multiplikační efekty kulturních odvětví v české ekonomice. Arts and Theatre Institute, Prague.

Raabová, T. 2011. Metodika pro výpočet ekonomických dopadů kulturní organizace. Arts and Theatre Institute, Prague. Online: <http://www.idu.cz/media/document/metodika_vypocet_ek_dopadu_df11p01ovv031.pdf>

Raabová, T., Tichá, A., Merta, P. 2013. Possible methods for measuring economic impacts of cultural tourism. In: Smith, M., Richards, G. The Routledge Handbook of Cultural Tourism. Abingdon, 2013. ISBN: 978-0-52351-6.

Rasmussen, P. N. 1956. Studies in Intersectoral Relations. Amsterdam, 1956.

Richards, G. 2007. Cultural Tourism: Global and Local Perspectives. The Haworth Press, Inc., New York, 2007,. ISBN 978-0-7890-3116-7.

Rojíček, M. 2006. Strukturální analýza české ekonomiky. Working Paper CES VŠEM, 2006, no. 1. ISSN 1801-2728.

Rojíček, M. 2007. Klíčová odvětví v české ekonomice z pohledu input-output analýzy. In: Statistika, 2007, no. 2, pp. 133-145. ISSN 0322-788x. Praha : ČSÚ.

Rojíček, M., Vavrla, L. 2005. Využití input-output tabulek v ekonomické analýze. Pracovní sešity CES VŠEM, 2005, no. 12. ISSN 1801-5956.

Rojíček, M., Vavrla, L. 2006. Sestavování symetrických input-output tabulek a jejich aplikace. In: Statistika, 2006, no. 1, pp. 28-43. ISSN 0322-788x. Praha : ČSÚ.

Seaman, B. 2003. Economic impact of the arts. In R. Towse (ed.): A Handbook of Cultural Economics, pp. 224-231.

Snowball, J. 2008. Measuring the Value of Culture - Methods and Examples in Cultural Economics. Berlin: Springer Berlin Heidelberg. ISBN 978-3-540-74360-6.

Stynes, Daniel J. 1997. Economic impacts of tourism. Illinois Bureau of Tourism, Department of Commerce and Community Affairs.

Throsby, David; Withers, Glen. 1993. The Economics of the Performing Arts. 2nd ed. Hampshire, England : Gregg Revivals, 1993.

United Nations. 1999. Studies in Methods, Handbook of National Accounting: Handbook of Input-Output Table Compilation and Analysis. Series F, No. 74. United Nations, New York 1999.

Whiting, Peter. 2004. Economic Impact Model for Arts and Heritage: Instruction Manual. Prepared for The Department of Canadian Heritage and The Canadian Tourism Commission.