

# THE CZECH SCIENCE PARK CRITICAL LOCATION FACTOR ANALYSIS

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**Abstract:** *The contribution is focused on the critical location factor analysis of science parks in the Czech Republic. The analysis investigates four major critical location factors – Proximity to international airport, Proximity to capital cities, Good road network and Good rail link to capital cities. These factors are applied to the science parks registered at the Science and Technology Parks Association. The results show the dominance of the science parks located near the biggest cities – Prague and Brno. It is mainly because of the excellent access to the highway and international airport for the tenants. However many science parks from other regions performed well, which is mostly consequence of the above-standard access to the highway. On the other hand for the same reason science parks located apart from highways performed poorly. The contribution contains the results for the all science parks by individual factor or by overall score. The analysis is also focused on the data distribution of the results for better understanding the outcome.*

**Keywords:** *Critical factors, Location analysis, Science parks, Startups.*

**JEL Classification:** *M13, M21.*

## Introduction

Science parks are organizations helping startup companies to accelerate their growth. However there are many needs and prerequisites which are related to the science park location. The analysis is focused on the one of the three critical factors for the science parks – park location. The analysis investigates four major critical location factors – Proximity to international airport, Proximity to capital cities, Good road network and Good rail link to capital cities. These factors are applied to the science parks registered at the Science and Technology Parks Association.

The aim of the contribution is to examine location factors of science parks and according to the result present the situation in the Czech Republic and make relevant conclusions.

## 1 Literature overview

### 1.1 Science parks

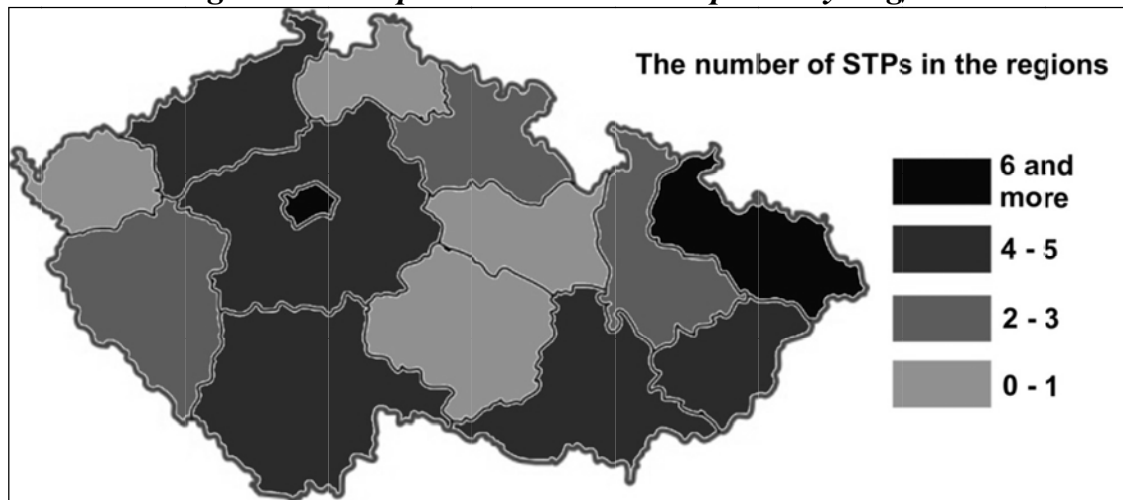
Science parks are one of the ways how small and medium enterprises could be accelerated in its growth. Science parks support SMEs by providing finance (grants and subsidies, cost effects of taxation and compliance), providing information, providing specialist advice and finally helping with training and personnel development. [2]

According to the International Association of Science Parks (IASP), the science and technology parks can be defined as “an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions”. [5] The main roles of science parks are competitiveness growth, commercialization of science and support of innovation firms [1]

The concept of science parks is dated to the half of twenties century where the first science park was established within Stanford University, later well known as Silicon Valley. [7]

In the Czech Republic the first science parks emerged after the fall of the communism in the 1990's. Science parks in the Czech Republic are aggregated and certified by Science and Technology parks Association CR [8] Research shows that science parks are unevenly distributed across the Czech Republic as it is possible to see in Fig. 1. Therefore the location conditions are different for each science park. [4] Nowadays, the number of certified science parks in the Czech Republic is 42. [9]

**Fig. 1: Science parks in the Czech Republic by Regions**



Source: [4]

Koh et al states that science parks “play an incubator role, nurturing the development and growth of new, small, high-tech firms, facilitating the transfer of university know-how to tenant companies, encouraging the development of faculty-based spinoffs and stimulating the development of innovative products and processes.”[6]

## 1.2 Critical factors of the science parks

According to Zhang science park's factors can be divided into three main categories – park location, park preparation and park management team. Studies show that there are several location factors for a successful science park which is presented in Tab. 1.

These location critical factors are similar in Europe and USA, therefore the factors can be considered as universal. Zhang defends importance of proximity to international airport because many technology industries serve an international market, also the desire to be close to the capital city and location with good road and rail links is important for the science park tenants. [11]

Similar research made Centre for Strategy and Evaluation Services, where location factors got medium importance in comparison to other factors. [3]

**Tab. 1: Importance of location factors for a science park**

Factor	Essential	Important	Relevant	Irrelevant
Proximity to supplier			*	
Proximity to domestic airport			*	
Proximity to international airport	*			
Proximity to seaport				*
Proximity to capital city		*		
Good road network	*			
Good rail link to capital city		*		

Source: [11]

## 2 Methods

The Science and Technology Parks Association CR has record of 42 science parks in the Czech Republic in the year 2014. These science parks will be examined in the analysis.

According to the literature review there were used four location factors which have importance at the levels Essential or Important to be applied to the Czech science parks.

These four location factors are:

- Proximity to international airport,
- proximity to capital city,
- good road network,
- good rail link to capital city.

The methodology for identifying the individual factors is different from factor to factor. However as a base factor calculation was used the formula for ranking the competitiveness of the countries by World Economic Forum and it is divided into two formulas – with positive and negative influence.

### Positive influence

$$6 * \left( \frac{\text{Country score} - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 1$$

Source: [10]

### Negative influence

$$-6 * \left( \frac{\text{Country score} - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 7$$

Source: [10]

The formula was redesigned for the purpose of the location critical factors used in the analysis.

### Proximity to international airport

Because of the negative influence of the score (higher distance – worse score) it was used suitable formula and it was adapted to fulfill its purpose.

There are four international airports in the Czech Republic – in Karlovy Vary, Prague, Brno, Ostrava and Pardubice.

$$-6 * \left( \frac{T - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 7$$

Where T is ideal time needed to reach the closest international airport by car.

### Proximity to capital cities

In order to eliminate clear advantage of the Prague science parks, the formula was adjusted not only to examine proximity to capital city, but the average proximity to reach Prague and Brno which are two of the biggest cities in the Czech Republic.

$$-6 * \left( \frac{\left( \frac{P + B}{2} \right) - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 7$$

Where P is ideal time needed to reach Prague by car and B is ideal time needed to reach Brno by car.

### Good road network

$$-6 * \left( \frac{R - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 7$$

Where R is time needed to reach the closest highway.

### Good rail link to capital city

$$-6 * \left( \frac{\left( \frac{P + B}{2} \right) - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}} \right) + 7$$

Where P is ideal time needed to reach Prague by train and B is ideal time needed to reach Brno by train from the city where the science park is situated.

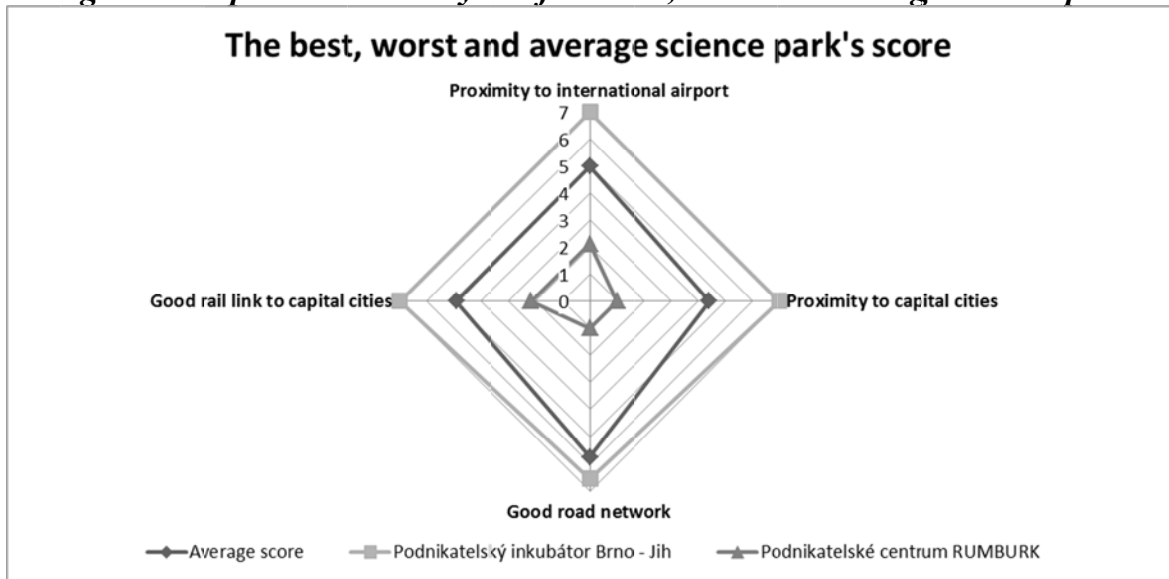
## 3 Problem solving

The analysis was performed on the sample of 42 science parks registered in the Science and Technology Parks Association.

The Appendix 1 shows the table with individual score of all science parks by explicit factors and total score. The best performed science park by total score is Podnikatelský incubator Brno – Jih and the worst score acquired Podnikatelské centrum Rumburk. In general it is possible to state that science parks in Prague region and Jihomoravský kraj received the highest ranks. It is due to the very good availability to the international airport and highways. However other science parks which are not situated in these regions also received high ranks. This applies mostly for the science parks situated near highways.

Fig. 2 shows chart representing the best, worst and average science park by individual factors.

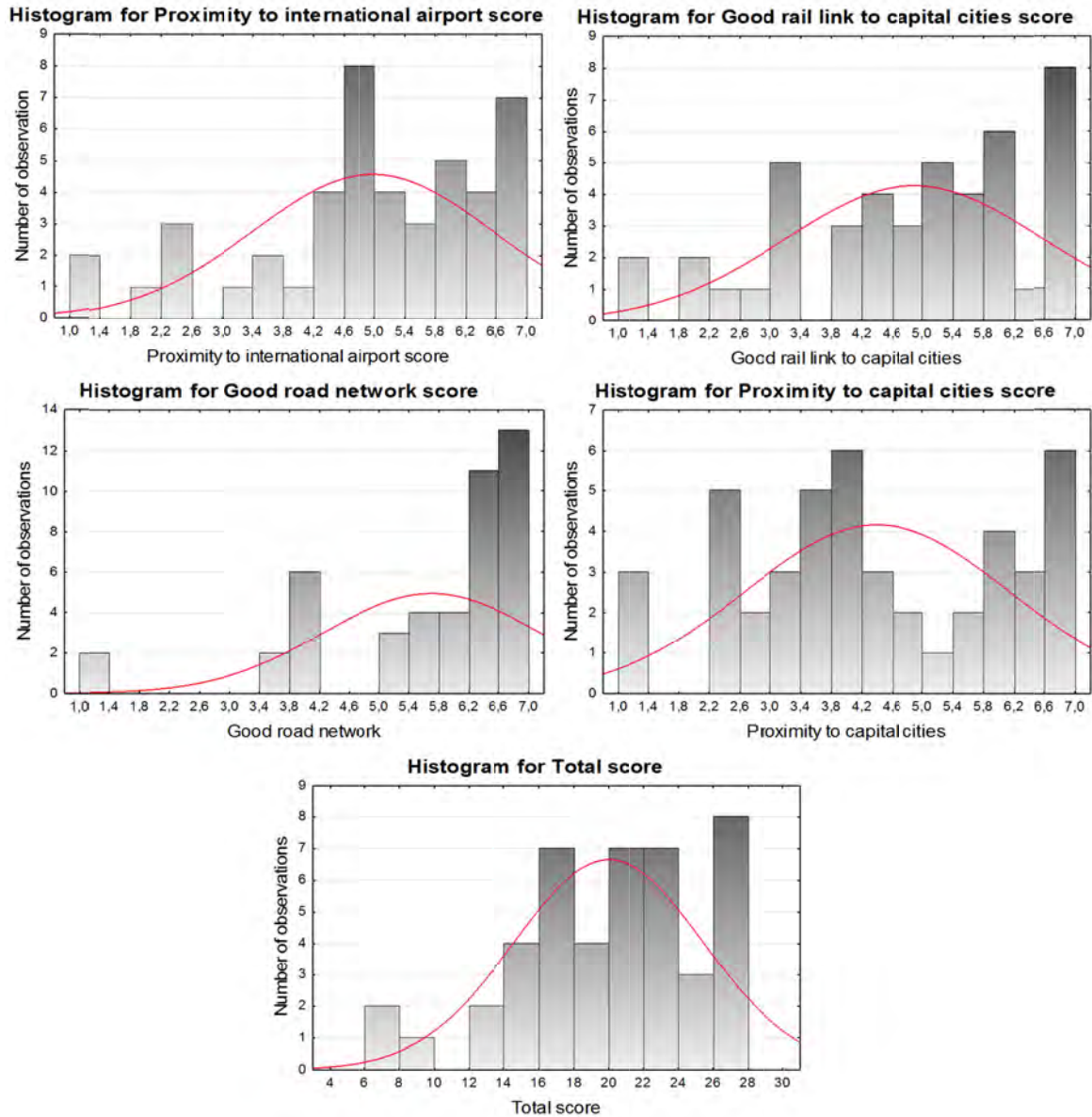
**Fig. 2: The spider chart analysis of the best, worst and average science park**



Source: Author

Results from the histograms performed on the separate factors and total score are showed on the Fig. 3. Chart shows data distribution of the critical factor analysis results.

**Fig. 3: Distribution of data in the analysis results**

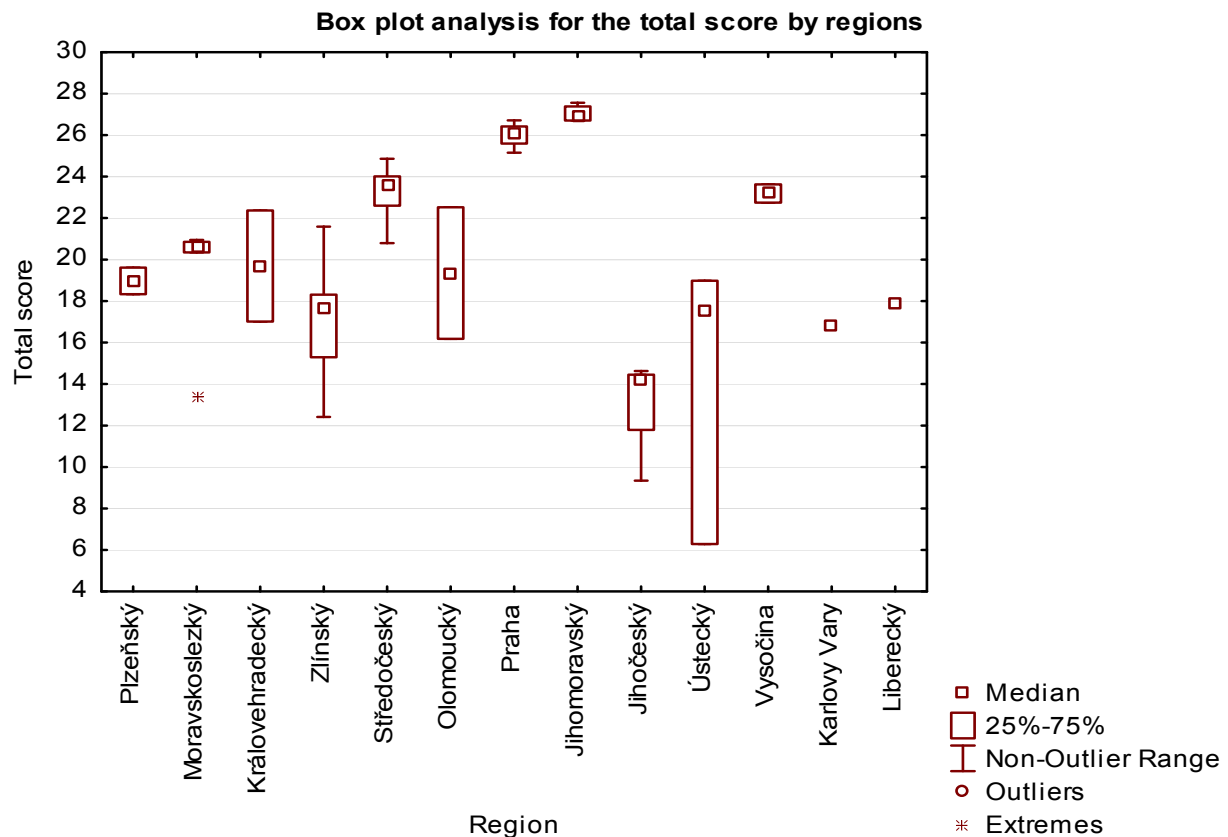


*Source: Author*

Another view on the data is by regions in the Czech Republic. The analysis is showed in Fig. 4. It was anticipated that science parks in Brno and Prague will seize the top ranks in the results, but there were found that also science parks from region Vysočina and Středočeský kraj received high total score. It is mainly because of the good access to highway and its location near the biggest cities.

The worst ranks received science parks from Ústecký and Jihočeský kraj. However the results have high level of variability. Therefore it vastly depends on the particular location of the science park in the region.

**Fig. 4: Box plot analysis of the results by regions in the Czech Republic**



Source: Author

## 4 Discussion

The critical location factors analysis has some restrictions. The calculations were artificially defined and it can't take in the consideration all the factors which location of the science park is influenced by. However it shows the importance of the quality highway network which allows companies first-rate access to the international airports and biggest cities.

According to studies there are three categories of critical factors for science parks - park location, park preparation and park management team. This contribution is focused solely on the park location critical factors. The results aren't therefore complete and the further studies which are focused on the other two critical factor categories are necessary to receive global view on the science parks critical factors.

## Conclusion

Science parks are organizations which provide support to the startup companies. Because science parks are companies like others there are critical factors for their business. The studies define three main categories - park location, park preparation and park management team. The contribution focuses on the park location critical factors which were defined as Proximity to international airport, Proximity to capital cities, Good road network and Good rail link to capital cities.

The analysis performed score calculation for all science parks registered at the Science and Technology Parks Association. The results show the advantage of science parks situated

in region Praha and Jihomoravský kraj, which received highest ranks however other science parks from other regions such as Vysočina or Středočeský kraj received high score as well.

On the other hand science parks situated in the Ústecký and Jihočeský kraj performed second-rated. It is mainly because lack of the access to the highway which would reduce time needed to reach international airports and biggest cities. However the variability of the results in these regions is very high therefore it vastly depends on the particular location of the science park. In contrary to the previous example science parks in the Praha region and Jihomoravský kraj has much lower variability of the total score therefore the importance of the individual science park location in these regions is lower.

The recommendation according to the results is that the location of the science park is important part of the science park location decision making process. The competent person should also consider the location of the park and especially its access to the highway and not to focus solely on quality based attributes.

### Acknowledgement

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