



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

Impact of the COVID-19 Pandemic on Construction Companies in the Czech Republic

Martin Nový^{a*}, Jana Nováková^a

^aBrno University of Technology, Faculty of Civil Engineering, Veveří 331/95, 602 00 Brno, Czech Republic

Abstract

The global COVID-19 pandemic has been a part of our lives for the second year in a row and it has affected the activities of all economic entities across individual fields and industries. This article deals with research into the impact of the COVID-19 pandemic on construction companies in the Czech Republic. The research presented in this paper consists of several consecutive steps: designing a research plan, performing data collection and analysis and compiling research results. Qualitative approaches to data collection and evaluation, especially in-depth interviews and the coding method, were used for contextual understanding and comprehension of the situation in the companies under research. Open questions (topics) related to the respondents' experience, perceptions and opinions were created as a part of the preparation process. The aim was to obtain reliable and relevant answers to the questions asked. The research, which lasted for 5 months, involved 16 medium-scale and large companies from the Czech Republic. The aim of the research described in this article was to find out about the development of construction companies in the first half of 2021 and to specify their results in selected areas of activity.

© 2021 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

Peer-review under responsibility of the scientific committee of the CENTERIS –International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

Keywords: COVID-19 pandemic, construction industry production, Czech Republic, research into construction companies

* Corresponding author. Tel.: +420 541 148 631

E-mail address: novy.m@fce.vutbr.cz

1. Introduction

At the beginning of 2020, the COVID-19 coronavirus infection first affected Europe and the Czech Republic inconspicuously with a low number of patients. However, its infectivity was high and it quickly spread throughout the world like a pandemic with a surprisingly high number of sick and unfortunately, dead. The management of the pandemic required a number of yet unknown measures introduced by national government regulations. These regulations concerned the closure of non-vitally necessary shops, most services, catering and restaurant facilities, cultural and sports facilities, schools of all levels, restrictions on public administration, public transport and the ban on private travel. Healthcare that struggled to meet the requirements only with the utmost effort needed crisis management. Industrial production has also been affected by these restrictions. Production in the companies, even the large ones, was interrupted for several weeks. There were problems with providing supply services and the companies were facing a shortage of employees due to illness, compulsory quarantine and a ban on the arrival of foreign construction workers into the Czech Republic after the restoration of the production. [2]

The course of COVID-19 pandemic in the Czech Republic is shown in Figure 1. It shows a slight increase in the spring of 2020, a decrease over the summer and fluctuation in increases and decreases in the autumn of 2020 (with the maximum on October 29 – 122,541 persons), in the winter of 2021 (with the maximum on January 7 – 118,666 persons) and in the spring of 2021 (with the maximum on March 14 – 159,930 persons). The current situation in May 2021 shows a positive development due to the introduced restrictions and mass vaccination. Both the Czech Republic and the whole of Europe are returning to their usual way of life. [1]

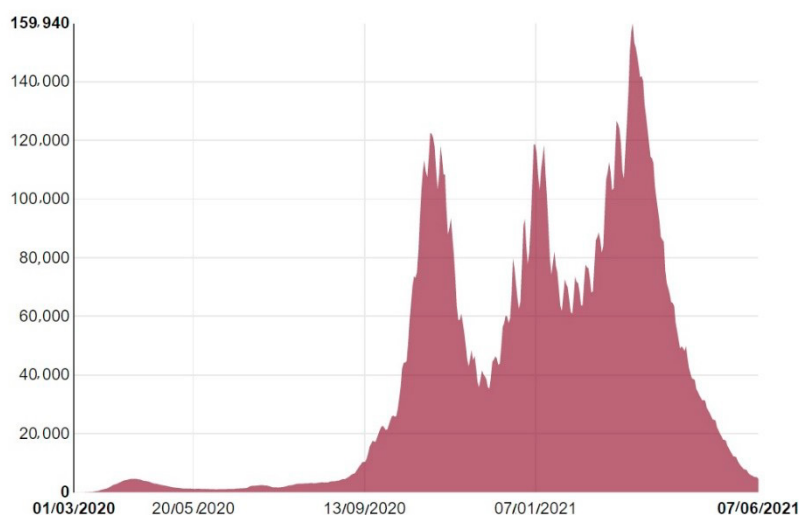


Fig. 1. The trend development profile of the number of persons with laboratory-proven COVID-19 disease in the Czech Republic [1]

The negative impact of the pandemic reduced the performance of the entire national economy. This can be seen in the results of the quarterly survey of gross domestic product and construction production for 2020 carried out by the Czech Statistical Office. [2]

Table 1. Gross domestic product of the CR/Unit of measurement in %/The same period of the previous year = 100/Constant prices [2]

Quarter/year	2016	2017	2018	2019	2020
Q1	103.0	104.5	104.2	102.5	98.6
Q2	103.3	104.7	103.1	102.1	89.4
Q3	101.8	105.5	102.7	103.0	94.7
Q4	102.1	105.8	102.9	101.7	95.2

The construction production index for 2020 had a different course compared to the gross domestic product index. The construction production was still growing in the first quarter. However, a decline can be seen in the second quarter, which deepened even further in the second half of the year and was even larger than the decline in the gross domestic product.

Table 2. Construction production index/Unit of measurement in %/The same period of the previous year = 100/Constant prices, Seasonally adjusted [2]

Quarter/year	2016	2017	2018	2019	2020	2021
Q1	94.9	96.8	108.0	107.9	102.1	93.5
Q2	89.4	107.7	106.7	105.0	94.4	
Q3	94.2	102.6	112.5	101.2	91.9	
Q4	99.5	104.3	105.8	103.7	91.9	

The Czech construction industry has been doing well since 2017. The construction production index was growing for three years in a row. The consequences of the pandemic and the associated state of emergency have begun to manifest themselves since the second quarter of 2020. Initially, smaller companies were affected, in which employees were on sick leave, child-care leave or unpaid leave. Larger companies were hit by the outflow of foreign construction workers. Demand due to administrative unpreparedness of constructions decreased in the second half of 2020. In the first quarter of 2021, production fell again, however, the decline was no longer so sharp.

It is interesting to monitor and compare the development of construction production in other European countries. The only countries where there was no decline in production in 2020 were Germany and Romania. On the contrary, a deeper decline compared to the Czech Republic was in Slovakia, Spain, Italy, the United Kingdom, Hungary and Bulgaria. In 2021, the construction market has still been fluctuating and at its beginning, the production fell by a percentage month on month. [3]

2. Present state references

The COVID-19 pandemic has already been part of our lives for two years. It has affected all its aspects - personal, family, social, work, health, economic, business, cultural and transport. A number of national and international studies are being created on these topics. The impact of the pandemic on the business sector in the construction industry in the Czech Republic was addressed by CEEC Research in the Study of Economic Impacts of COVID-19 on the Construction, Development and Design Companies in 2020 [4]. Its scope was quite broad, covering expected construction market development, the impact on public procurement, company revenues, economic results, and the implementation of the governmental and own measures.

The main conclusions of the study are listed below (selected impact - representation in some companies):

- Lower number of employees - 86%,
- Extension of the implementation period - 65%,
- Suspension of the implementation - 53%,
- Lack of building materials - 18%,
- Introduction of anti-pandemic measures in the company - 94%,
- Introduction of a home office of technical and economic employees - 96%,
- Provision of protective equipment - 82%,
- Changes in shift rate - 22% [4].

The aim of the research described in this article is to identify further development in the first half of 2021 and make the results in selected areas of activity of construction companies more detailed.

3. Methodology

Qualitative approaches to data collection and evaluation, especially in-depth interviews and the coding method, were used for contextual understanding and comprehension of the situation in the surveyed companies. The aim was to get more reliable and relevant answers to the questions asked.

A qualitative approach represents a number of different procedures that try to analyse the researched issue. The aim is to approach a certain phenomenon in the most complex form possible, including relations to other aspects. The qualitative method makes it possible to modify or supplement the questions during the research. The most common techniques of a qualitative approach include in-depth interviews, non-standardized observation and content analysis. In-depth interviews try to capture deeper causes of certain opinions or behaviour. The interviewer encourages the respondent to formulate his own answers by clearly composed questions. These are subsequently processed and evaluated by the interviewer. The standardized interview looks like reading a questionnaire to the respondent, who selects pre-prepared variants of answers. However, the in-depth interview resembles a free interview without a fixed structure. [5] [6]

An interview made with the help of guidelines was used in this research, which aim was to identify the impacts of the COVID-19 pandemic on the selected medium-scale and large companies. The guidelines were compiled based on the current state of scientific knowledge and literary research. Although the guidelines are followed, the order or the exact wording of the questions does not matter and the interviewer can adapt them.

The methods of sorting and evaluating data in qualitative research are quite diverse. The coding method was used in this research. Coding is defined as the division of data sets into sub-units: segments and their subsequent naming and sorting. This is repeated several times during the analysis which refines the results. If the evaluation of material and its further collection do not bring anything new, theoretical saturation can be achieved and the research can be terminated. Open coding takes place during the first data analyses, it creates categories and identifies basic areas. [5] [7] [8]

The open coding method was used in this research to process data and evaluate the results of in-depth interviews. Open coding, focused on the careful study of data, was used in the analysis of in-depth interviews. Categories were created and relations between them were defined based on the codes. Subsequently, the analysed data was repeatedly rearranged in order to create logical connections between the categories. The coding thus identified the units that form the context of the issue.

4. Results and discussions

4.1. Design of research plan, data collection and analysis

Qualitative approaches to data collection and evaluation, especially in-depth interviews and the coding method, were used for contextual understanding and comprehension of the situation in the surveyed companies. They were chosen mainly due to the tendency to make the results better by the respondents, or irrelevant respondents appear in the quantitative surveys (especially in questionnaire surveys). An interview using guidelines was used for in-depth interviews. As part of the preparation process, 11 open questions (topics) related to the respondents' experience, perceptions and opinions were created.

Some questions also included sub-questions. During the testing, the topics of the interviews were verified in order to find out whether in practice they work as intended. In total, the course of the in-depth interviews was tested with 2 respondents, each of whom represented one of the groups defined below. Following a successful test on a small sample, it was possible to continue the research. The sample of respondents was defined as respondents who work in middle and senior management in medium-scale and large companies in the Czech Republic. The interview was conducted with a total of 22 experts from practice from a total of 16 companies (of which 10 medium-scale and 6 large) in accordance with this rule. There was no need for more interviews, as the same data, including identical experience, were repeated in the outputs.

Table 3. Compiled questions for the in-depth interview

Number	Question
1	How many permanent employees do you have?
2	Have you struggled with a shortage of construction workers and what was the reason?
3	Have you dismissed permanent production staff?
4	What have you had to change after the crisis breakout?
5	How did you protect your employees on the construction sites?
6	Which part of the technical and economic staff has been assigned home office?
7	Did your company cancel any building contracts before their start?
8	Has the pandemic affected your foreign activities?
9	Has the pandemic affected the price of your building contracts?
10	Have you suffered from the delay in the building material delivery during the pandemic?
11	Has the handover of the construction been delayed due to the pandemic?

4.2. Compilation of the research results

The most frequently discussed areas were selected from the conducted interviews and adequate questions were formulated dealing with them. The response to each question was associated with a single answer that most accurately or predominantly corresponded to the situation of the respondent. The exceptions were questions 4 and 5, where it was possible to choose more than one answer.

Question 1 divided the research participants according to the number of employees into medium-sized companies of up to 200 employees (62%) and large companies with more than 200 employees (38%) according to monthly averages for 2020. However, the following questions did not take Question 1 into account.

Question 2 concerned the shortage of construction workers and the reason for it. The most common reason was a compulsory quarantine lasting for 14 days. A detailed overview is given in Fig. 2.

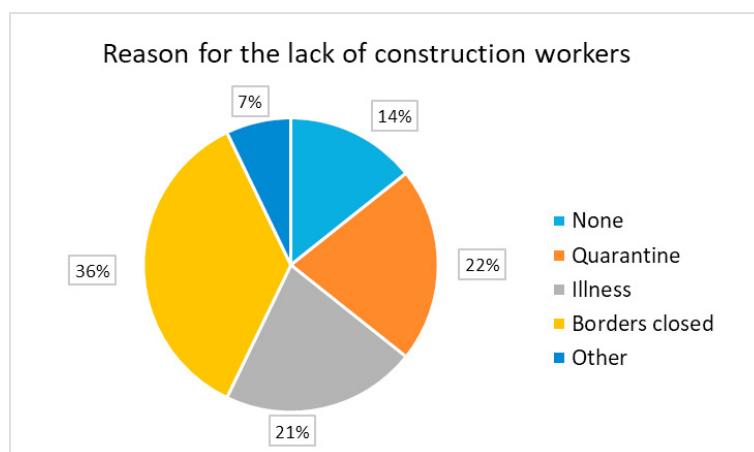


Fig. 2. Structure of the construction workers shortage and its reasons

The answers to Question 3 described the situation with the dismissal of permanent construction workers. A negligible or zero number of dismissed workers were reported in 53% of responses. Question 4 concerned organizational changes in companies after the new wave of the pandemic in 2021. The decisive change (44%) was reported for the organization of work on the construction sites, while the transfer of workers between the construction sites was reported with the lowest value (12%).

Fig. 3 shows the structure of the answers to Question 4. The most common type of protection of employees against infection was the disinfection of changing rooms and sanitary facilities.

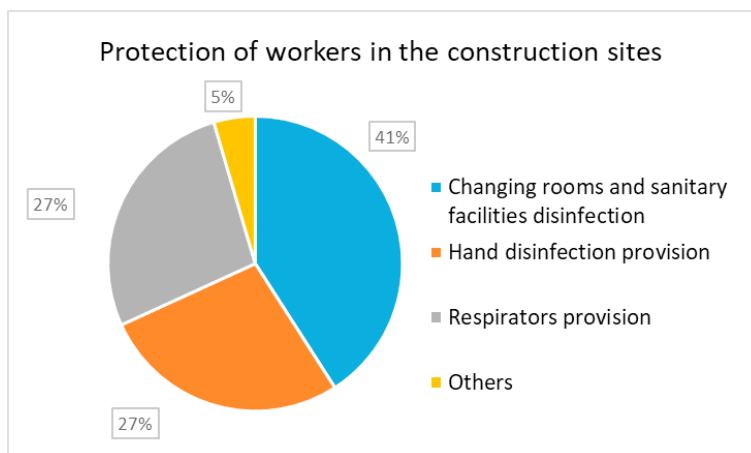


Fig. 3. Type of the protection of the employees in the construction site

Question 6 concerned the introduction of a home office for technical staff. The home office has been introduced in all companies. The answer of 80% and more employees characterized 69% of companies.

Question 7 focused on the cancellation of planned contracts before they start. Only 6% of respondents mentioned more cancelled contracts. Question 8 described the impact of the pandemic on company foreign activities. 13% of companies reported a medium impact, 62% of companies reported a minimal or small impact. 37% of companies had no foreign activities.

Question 9 dealt with the contract price development. The results obtained are shown in Fig. 4.

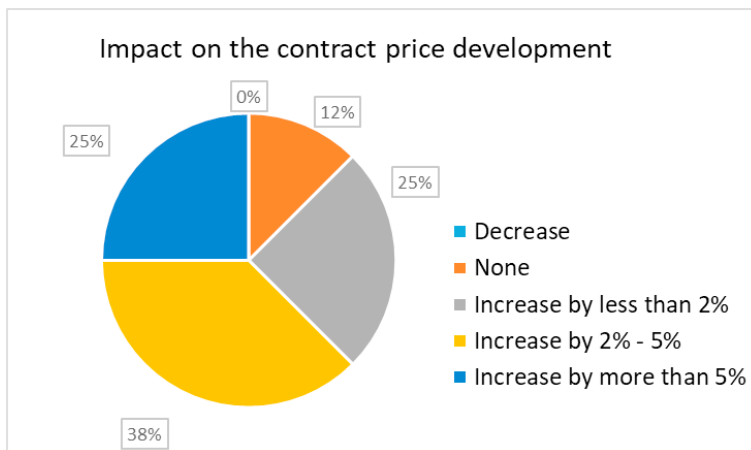


Fig. 4. Changes in building contract prices

Question 10 examined the situation with delays in the building material delivery. No delays were reported in 37% of companies, 13% reported more delayed deliveries, 6% described delays as very common.

The last Question 11 classified the delay in handing over construction works due to the pandemic. 6% of companies reported more cases of delay, 31% of companies reported several cases of delay. 63% of companies handed over a negligible number of delayed constructions works or their works were not delayed.

5. Conclusion

The declining construction industry production in the Czech Republic in 2020 and the first quarter of 2021 has been proven by the official results of the Czech Statistical Office survey [2]. It is certain that the decline in construction industry production will be reflected in the second quarter of 2021 in connection with the ceasing of the pandemic. The decrease in construction industry production had and still has several causes. One of the most significant is the lack of employees caused by the health situation and limited availability of workers from abroad. Problems with the supply of building material and products built into the buildings play an important role. This situation led to the suspension of some contracts or their later commissioning. The results of the presented research follow the above-cited older research [4] and demonstrate a comparable development with more favourable trends.

It can be assumed that due to the positive development of the pandemic at the end of the second quarter of 2021, construction production will start to grow and the construction production index related to the same period of the previous year will again have values greater than 100%. The COVID-19 pandemic has also had a positive impact on the functioning of construction companies. It turned out that the standardly used methods of construction project management must be supplemented by completely new measures introduced by the company management in times of crisis situation. These include, in particular, the use of home offices of technical and economic staff, optimization of production processes under given and often uncontrollable conditions and maintenance of existing and acquisition of new human and material resources. We assume that in the future there will be enough projects within the construction industry commissioned by both public and private investors and the construction production will grow similarly to the period prior to the pandemic.

The performed survey in the area of prices can be followed by questions in the area of costs of construction projects and their structure. Such a survey and its results are a suitable task for further research.

References

- [1] Trendový profil osob s laboratorně prokázaným onemocněním COVID-19 v ČR [online]. [cit. 2021-6-14]. Available at: <https://www.kurzy.cz/koronavirus/aktualne/>
- [2] HDP, národní účty, 2021. Czech Statistical office [online]. [cit. 2021-5-30]. Available at: https://vdb.czso.cz/vdbvo2/faces/cs/index.jspx?_afPp=statistiky&katalog=30832
- [3] Impact of Covid-19 crisis on construction [online]. [cit. 2021-5-30]. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Impact_of_Covid-19_crisis_on_construction#Development_of_construction_production_in_February_2021
- [4] CEEC Research, 2020. Studie ekonomických dopadů Covid-19 na stavební společnosti [online]. [cit. 2021-5-30]. Available at: <https://www.hochtief.cz/pro-media/aktuality/studie-ekonomickych-dopadu-covid-19>
- [5] HENDL, Jan, 2016. Kvalitativní výzkum: základní teorie, metody a aplikace. 4., actualized ed. Praha: Portál, 440 pp. ISBN 978-80-262-0982-9.
- [6] ŠIROKÝ, Jan, 2011. Tvoříme a publikujeme odborné texty. Brno: Computer Press. ISBN 978-80-251-3510-5.
- [7] REICHEL, Jiří, 2009. Kapitoly metodologie sociálních výzkumů. Praha: Grada. ISBN 978-80-247-3006-6.
- [8] STRAUSS, Anselm a Juliet CORBIN, 1999. Základy kvalitativního výzkumu: postupy a techniky metody zakotvené teorie. Brno: Sdružení Podané ruce. ISBN 80-858-3460-X.