

The Effects of COVID-19 on Productivity in Project Management: A Case Study

Emily Gonzalez
California Polytechnic State
University San Luis Obispo, CA

The COVID-19 pandemic has affected many aspects of the construction industry and one of the main aspects that has been affected is productivity. Monitoring productivity on a job is important because it allows us to identify areas that take up the most time and thus gives us the opportunity to allocate resources effectively. Due to safety regulations and new protocols being put in place, the productivity levels on every job has changed. Whether its out in the field or in the office, workplace productivity has certainly been affected by COVID-19. This case study focuses on how the pandemic has affected productivity on the project management side of a job. It was determined that COVID-19 had an overall negative effect on the productivity of multiple jobs. This includes setbacks related to the schedule and project funding. These conclusions were determined after conducting semi-structured interviews with 10 project engineers/managers at Swinerton Builders. The purpose of this case study is to inform construction companies on how their project's productivity levels have been affected by COVID-19. This is to identify necessary adjustments these companies will have to make in order to improve the productivity on their projects.

Key Words: COVID-19, Productivity, Project, Management, Construction

Introduction

COVID-19 in the Construction Industry

COVID-19 is “a mild to severe respiratory illness that is caused by a coronavirus, is transmitted chiefly by contact with infectious material or with objects or surfaces contaminated by the causative virus, and is characterized especially by fever, cough, and shortness of breath and may progress to pneumonia and respiratory failure” (Covid-19, October 2020). By January 2020, the coronavirus had spread to California and continued to spread all throughout the world creating an unprecedented global pandemic. To flatten the curve, on March 19th, 2020, California Governor Gavin Newsom ordered everyone to shelter in place until the number of cases started to decline. This order greatly affected the construction industry as many projects were put on hold. However, in the Bay Area, there were limited types of construction which were permitted to continue, including the following: healthcare projects directly related to addressing the COVID-19 pandemic, housing and mixed use projects that includes at least 10% affordable housing, projects that provide services to vulnerable populations projects required to maintain safety, sanitation, and habitability of residences and commercial buildings, and construction necessary to secure an existing construction site that must shut down (Publication, 2020).

On May 4th, 2020 all construction activities were allowed to resume with specific safety protocols (Nguyen, 2020). These protocols include cloth face coverings/masks, practicing social distancing (six feet apart from others), and designating a site specific COVID-19 supervisor to enforce this guidance (Cal/Osha, 2020). These new protocols changed the way we build and have greatly affected the construction industry.

Literature Review

Due to the unprecedented nature of COVID-19, research on how the pandemic has affected productivity in construction, specifically on the project management side of a job, is not yet available. However, research on construction productivity in general and how COVID-19 has changed the workplace is worth analyzing. Understanding how a project's productivity changes and the various effects it has on a job will further our understanding of how to improve it.

Productivity in Construction

It is difficult to measure the overall productivity of a job since every job is different. The Bureau of Labor Statistics (BLS) is an organization that analyzes labor market activity in the United States. This includes data on productivity. They do this to inform the public and support both public and private decision making. However, the BLS does not report statistics on the productivity of construction because of the varying nature of every job. As stated in the news article *Measuring Productivity Growth in Construction*, "the main difficulty is that buildings differ widely in their characteristics and features. Similarly, the nature of the underlying terrain varies widely among construction projects. Consequently, economists, both in general and within the BLS productivity program, have found it exceptionally difficult to develop reliable output price deflators to convert observed revenues into meaningful measures of output growth over time" (Sveikauskas, 2020, pg. 1). Therefore, we must measure productivity in construction by looking at individual components of a job.

One of the components to assess is labor productivity. While there are many components that contribute to a project's productivity, labor is one of the main ones. Labor in this sense refers to the manual labor that a job requires to be built to completion. The BLS provides some data on this aspect of construction. This is done by tracking the output per hour on any given job over a period of time. This data will differ depending on the industry sector. For example, the data from the industrial construction sector will be different from the residential construction sector because the projects they are responsible for are very different and typically last for different periods of time. Looking at Figure 1 below, we can see how the labor productivity is related to the output and the number of hours worked.

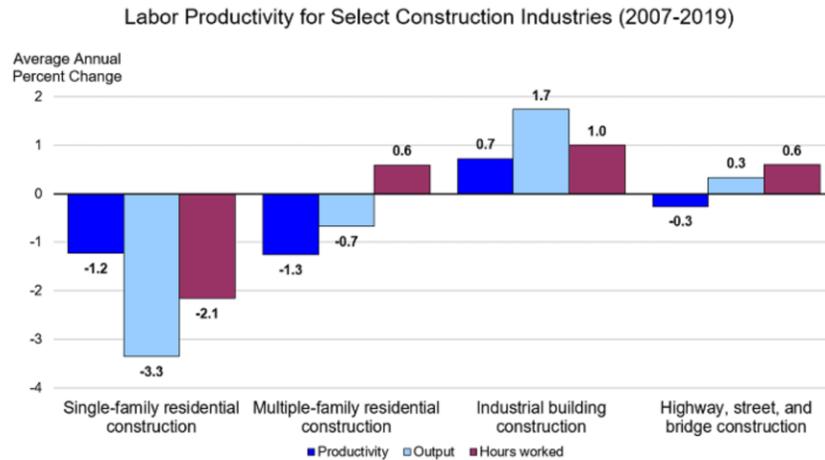


Figure 1. Labor productivity rates of various construction industries (U.S. Bureau of Labor Statistics, 2020).

After accounting for the productivity of the labor itself, there are other factors that contribute to the productivity of a construction project. As pointed out in the article *Pathways for the Improvement of Construction Productivity: A Perspective on the Adoption of Advanced Techniques*, other components that affect a project’s productivity are laser scanning, automated machines, and Building Information Modeling (BIM). These technologies contribute to the overall workflow of a job (Sabet, 2019). Furthermore, “BIM can help eliminate a range of issues that plague contractors, such as cost, schedule, constructability, and rework. It also facilitates collaboration with your entire project team so you can do more work faster” (Andersonis, 2020, pg.1). Recognizing the positive effects of BIM on a project’s productivity is important to understanding how we can utilize these technologies to our advantage in times like these.

COVID-19 and the Workplace

In addition to productivity in construction, looking at how COVID-19 has affected the workplace will also provide insight on how productivity might shift. The Center for Disease Control (CDC) has published new guidelines companies must abide by in order to ensure the safety of their employees in the workplace. These guidelines include; notifying your supervisor and staying home if you are sick, wearing a cloth face covering, limiting close contact with others by maintaining six feet of social distancing, and disinfecting frequently touched surfaces such as shared tools, machines, vehicles and other equipment, handrails, ladders, doorknobs, and portable toilets (CDC, 2019). It is important that all employees follow these guidelines since COVID-19 can spread easily and quickly. In addition, companies must “designate a safety and health officer to be responsible for responding to COVID-19 concerns at every jobsite. Workers should know who this person is and how to contact them” (CDC, 2019). This individual is important to the success of these safety procedures as they will be the ones to enforce the safety protocols.

Furthermore, the Associated General Contractors (AGC) provided more COVID-19 resources for contractors to access as they begin to navigate the new COVID-19 guidelines. This includes

a recap of current construction business conditions and a state-by-state business reopening guide (Coronavirus, November 2020). There is an interactive map that show what states are undergoing more restrictions, which states are partially reopened, and which states are already reopened. This is valuable information for all contractors as state guidelines ultimately dictate the parameters of any business.

Methodology

This case study uses qualitative and quantitative research obtained through ten semi-structured interviews with project engineers/managers as well as secondary sources such as news articles and academic journals. The semi-structured interviews provided a primary source in which a case study was developed. Through interviews both in person and over the phone, patterns in productivity were identified across multiple projects. Out of the ten people interviewed, seven of them were over the phone and three were in person. Their experience levels varied from four months at Swinerton to nine years at Swinerton. Three of the employees are project engineers and seven are project managers. The news articles and academic journals provided necessary background information on the pandemic and how it has affected the construction industry thus far. This background information is focused specifically on the state of California, as the case study data was also based in California.

After conducting initial research via secondary sources, ten semi-structured interviews were conducted during August 2020. These interviews were with project engineers and project managers working for Swinerton Builders. All the projects talked about in these interviews are in Northern California, primarily in the Bay Area. It is important to note that the pandemic has changed rapidly over time, and the data collected in this case study represents information obtained during August 2020. The COVID-19 information regarding these projects may have changed since August 2020.

Interview Questions

1. What is your position in the company and how long have you been with Swinerton?
2. In your opinion, has COVID-19 positively or negatively affected productivity on your project?
3. How has COVID-19 affected your project in particular? What activities were affected?
4. Have there been any cases of COVID-19 on your project? (Laborers or office personnel)
5. What are some additional safety measures that have been implemented that have slowed down productivity?
6. Have you taken any time off work due to COVID-19 or worked from home because of COVID-19? If so, was it more/less productive than coming into work at the office/jobsite?

Data Analysis

Overall Productivity Impacts

When asked if COVID-19 has positively or negatively affected productivity on their project, eight out of the ten project engineers/managers said it has been negatively affected. All the project engineers/managers interviewed are on different projects. Thus, there are ten different projects analyzed in this case study. All these projects are different in many ways because they have varying budgets, locations, teams, etc. Even with the diversity of projects, the data shows that COVID-19 has had an overall negative effect on the productivity of construction projects. There are multiple reasons for this shift in productivity as outlined below.

Activities Affected

When asked which activities were affected by COVID-19, seven out of the ten project engineers/managers said the schedule. The schedule on many jobs were changed due to the shutdown that took place in March 2020. The shutdown set projects back because they had to stop work on all these jobs. The degree to which a project was set back varies since each project is different. The longest schedule setback according to the interviewed employees was 3-4 months. This is a significant amount of time and will affect many other aspects of the job, including funding.

Five out of the ten project engineers/managers said their project's funding was negatively affected by COVID-19. This includes activities such as buyout and procurement. This is due to the ongoing economic impacts the pandemic has had on the construction industry. While some projects remained the same, there were also projects that took a hit financially which ultimately slowed down productivity. Without the proper funding from an owner, the job does not progress as quickly as it should. This is true for any job, pandemic or not. Both the schedule and the project's funding are very important aspects of the project management side of a job. Since these two activities were negatively affected by COVID-19, this data shows that the pandemic has negatively affected the productivity of these jobs.

COVID-19 Cases

Out of the ten project engineers/managers, six of them reported that there was at least one confirmed case of COVID-19 on their jobsite. The number of positive cases ranged depending on the size of the job. The lowest number of reported COVID-19 cases on a job was one. The most reported cases of COVID-19 on a job was 25. In all these cases, the majority of positive COVID-19 individuals were laborers or outside vendors.

Actions taken to reduce the number of positive cases included shutting down the job for a few days, having a cleaning crew go through the jobsite multiple times a day, increasing COVID-19 signage, and having more people on the project management side work from home or in the main office. All of the confirmed COVID-19 individuals were ordered to quarantine at home for at least 14 days.

New Safety Protocols

Due to new COVID-19 safety protocols and procedures, the productivity on every job has changed. All ten of the interviewed project engineers/managers said the productivity of their job was negatively affected due to these safety protocols. These safety procedures are

necessary for the well-being of all employees, but nonetheless, they have had a negative effect on the productivity of the job. For example, everyone is required to scan a QR code before they enter any Swinerton office or jobsite. This QR code leads to a short survey with questions about how the person is feeling and if they have been in contact with anyone who has COVID-19. These questions are a precautionary measure to protect everyone in the office or jobsite. While this is an important safety measure, it does take time.

Another safety protocol that has affected productivity is social distancing. All ten of the project engineers/managers interviewed talked about how their jobsite incorporates this rule and thus how it has slowed productivity. Since every worker must be at least six feet apart, the project management team cannot place as many crews on the jobsite as they normally would. They need to account for the space that will be available with the six-foot social distancing rule. This means they must stagger when subcontractors come in and therefore adjust the schedule.

In addition to the QR code and social distancing, another factor that has slowed down productivity is taking everyone's temperature before they walk onsite. This is to ensure that no one has a fever and thus no one has any COVID-19 symptoms. This protocol is not required on every jobsite because it depends on the city the job is located in. If they scan a person's forehead and the temperature comes back above 98.6 degrees, they must send that individual home immediately. This is in accordance with the CDC's workplace guidelines (Worker Safety). This process takes time like all the other safety protocols discussed. This is time that a worker would normally spend on their job. Therefore, these safety measures have decreased the project's productivity.

Working from Home

Due to the mandatory shutdown in March 2020, many projects were put on hold. There were rare exceptions in the case of some government jobs and low-income housing projects, but most construction projects were shut down for weeks. Because of this order, many companies including Swinerton Builders, had their employees work from home. All ten of the project engineers/managers interviewed worked from home due to the shelter-in-place order. The duration of time they worked from home varied between one week and three months.

The effects on productivity from working from home vary from person to person because everyone has a different home situation. For example, some employees have kids to take care of while others do not. When asked if working from home was more or less productive for them, the responses were about equal. Six of the ten said they were more productive working from home, while four of them said they were less productive.

Some of the reasons employees gave for being more productive included eliminating their commute time and having less people coming up to them asking questions. This makes sense as many people who work in the construction industry have a significant commute. The amount of time an employee would normally spend on their commute was now available for them to be actively working on their job. This increased productivity for these employees. Another reason some were more productive was because they had no one coming up to them asking questions. This is something that happens often on any project since being a project engineer/manager is a very collaborative job. Since they were not working with their team in person, there were less interruptions and they were able to have a more continuous workflow.

On the other hand, one of the main reasons employees gave for being less productive was

being interrupted by their kids or pets. Since school is also online due to the pandemic, kids are attending classes at home virtually. This means parents had to adapt to having their kids home all day long. This creates more distractions since taking care of kids is a full-time job within itself. This presented more challenges to working from home since they had to constantly multi-task. Working from home was less productive for these employees.

Results/Summarization

Question	Result
What is your position in the company and how long have you been with Swinerton?	3 are project engineers, 7 are project managers. Their experience ranges from 4 months to 9 years at Swinerton.
In your opinion, has COVID-19 positively or negatively affected productivity on your project?	8/10 said COVID-19 negatively affected productivity on their project.
How has COVID-19 affected your project in particular? What activities were affected?	7/10 said the schedule was negatively affected. 5/10 said the project's budget was negatively affected.
Have there been any cases of COVID-19 on your project? (Laborers or office personnel)	6/10 said there was at least one positive case of COVID-19 on their project. Most cases were laborers/vendors, not office personnel.
What are some additional safety measures that have been implemented that have slowed down productivity?	Social distancing, wearing a mask, taking temperature readings, limiting amount of people on site, scanning QR code, etc.
Have you taken any time off work due to COVID-19 or worked from home because of COVID-19? If so, was it more/less productive than coming into work at the office/jobsite?	10/10 had to work from home due to the shelter-in-place order. Time working from home ranged from 1 week to 3 months. 6/10 said working from home was more productive.

Figure 2. Data table of results from 10 semi-structured interviews.

According to the data obtained in this case study, COVID-19 had an overall negative impact on productivity when considering the project management side of a job. Seven out of the ten project engineers/managers said the schedule on their project was negatively affected by COVID-19. Five out of the ten employees said their project’s funding was negatively affected by the pandemic. Some of the safety protocols that also negatively affected the job’s productivity were; scanning a QR code, social distancing, and taking one’s temperature before going onsite. These safety measures vary depending on what city the job is located in. Furthermore, working from home has also affected productivity, but this effect varies from person to person. Since everyone has a different home situation, there were mixed results regarding their productivity while working from home. 60% of the project engineers/managers said that they were more productive, while 40% said they were less productive. All in all, COVID-19 has changed the productivity levels of a job in many ways.

Conclusion

This case study has shown that COVID-19 had an overall negative effect on the productivity of the project management side of a job. This includes setbacks related to the project’s schedule and funding. Many of these setbacks are out of anyone’s control, but it is important to analyze these changes in productivity so that possible solutions can be explored. Worker

productivity is an important aspect in any industry. When it comes to construction, the productivity of a job correlates to the project's success. Therefore, it is essential to recognize these productivity changes and develop solutions that keep our projects going. Like any industry, when there is a global event that effects the work, it is crucial to develop alternative methods that ensure the success of both the employees and the work they are doing.

Furthermore, the effects we are starting to see from COVID-19 are far from over. There will have to be many changes on both the office and field side to keep employees safe as the virus continues to spread all over the world. The fact that six out of the ten employees were on a job with at least one positive COVID-19 case means there is room for improvement. I was surprised to learn this because I thought the safety protocols were going to be more effective. Companies need to monitor these numbers regularly and create alternate solutions to improve these statistics. Working from home might be a possible avenue companies can take to accomplish flattening the curve. Six out of the ten interviewed said they were more productive working from home, which leads me to think this is a sensible solution that can only lower the chance of having a positive COVID-19 case on a job. I believe more companies will start having their employees (on the project management side) work from home. As the situation changes, companies will have to continue to adapt in ways that keep their employees safe and productive.

Areas of Future Research

COVID-19 has changed the construction industry in many ways. The pandemic is still ongoing and rapidly changing. This means we will have to deal with the effects of the pandemic in the years to come. There are many adjustments the construction industry has had to make due to the pandemic. In some cases, these changes have resulted in lower productivity. It is worth looking into these changes and analyzing how we can compensate for this loss of productivity. For example, new technology is currently being implemented in the construction process in order to avoid some of the challenges that come with working directly onsite. These technologies include drones and robotic machines that can help with certain trades on a jobsite. It is important to understand how these future technologies will benefit us in situations like a pandemic. Knowing how we can utilize technology to our benefit in tough situations like this will make us better builders.

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