



RAKEN



A Guide to Measuring
Construction
Productivity

1.

What's wrong with construction productivity in 2019?

The construction sector is one of the largest in the world economy, with about \$10 trillion spent on construction-related goods and services every year. However, the industry's productivity has trailed that of other sectors for decades, and there is a \$1.6 trillion opportunity to close the gap.

Mckinsey Global
Institute
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While it's true that construction is often considered a low-productivity industry, it's also true that measuring productivity is difficult when its definition isn't exactly black and white. On the surface, we see the stats. According to Mckinsey Global Institute, most construction projects tend to reach completion **61% longer than scheduled**, and hit up to **70% over budget**.

Part of the reason productivity is so tricky to measure is that project data collection methods are, to put it frankly, outdated. It's not exactly a secret that in general, the construction industry is averse to adopting digital project management technology. The construction industry invests **less than 1%** of revenue on average into R&D technology, despite the fact that digital tools could significantly improve productivity.

Construction
contributed to **4.1%**
of the United States'
GDP for 2018

The Trouble with Measuring Productivity

When you dig deeper, the problems with productivity are more complicated than they seem on the surface. For starters, no one can really agree on a definition, or even the scale to which we measure productivity. A variety of measurement standards have been produced, but so far, the one that captures the most accurate measurement of productivity has been the **Total Productivity Metric**. Productivity can be measured on both a micro and macro economic scale.

Micro productivity refers to the output of one company, and could be even as specific as just one project. It is generally measured through how much profit was made, how many resources were used, and how long the project or projects took. Macro productivity, however, looks at the industry as a whole, and can skew the perspective on the level of productivity in construction.

The concern here is that with an industry as impactful as construction, we really should be able to accurately measure and agree upon what productivity really means. Construction contributed to **4.1% of the United States' GDP** for 2018, and has fluctuated between 3% and 7% in the past decade. This means that construction productivity greatly affects the American economy, and in turn, the global economy. These numbers truly emphasize how crucial it is that we find a consistent way to measure construction productivity.

So we know that construction productivity is important, and we know that improving productivity can positively impact millions of lives. But, the overarching issue is that it is unclear what construction productivity actually is, because the definition usually takes into account a huge variety of different aspects of the construction process. However, we do know that accurate field data collection is key for productivity signals. If you utilize the Total Productivity metric in conjunction with proper field data collection, you can be confident that your sites will be using the best possible information.

2.

How are we currently measuring productivity?

Before determining whether or not the construction industry is productive, we have to find the best way to measure it. Over the last few decades, there have been about a dozen theories on how to define and measure productivity, but most focus on specific factors, as opposed to viewing the big picture. They measure productivity on the microeconomic scale, and to get to a macroeconomic perspective, data must be aggregated from a large sample size of projects.

These metrics generally include some combination of the following factors:

- Labor
- Capital
- Energy
- Material
- Service
- Manpower
- Quantities
- Equipment

Some simple theories and metrics have been accepted and used across the industry for years, but they still do not accurately capture all the information necessary to get a precise measurement of productivity in construction. Depending on what sort of productivity you are interested in calculating, you might find that these metrics are suitable, but to access an accurate measurement of total project productivity, it is critical to factor in all input and output factors. That's where the Total Productivity Metric comes in, but before we dive into that method, let's go through some common ways that productivity has been measured.

The Labor Productivity Metric

Construction industry researchers argue that one of the simplest and most widely used methods to measure productivity is to create a ratio of installed quantities to working hours, which is known as the Labor Productivity Metric. The issue, however, with the Labor Productivity Metric, is that on construction projects there are a wide array of different types of jobs and job specialties. With that, come different expectations for productivity, and therefore, the metric is often considered to be too broad.

Clearly, some materials will take longer to install than others, so tossing all the hours into what is essentially the Nutri-Bullet of labor productivity measurement can produce inaccurate results. To properly view the productivity of a project, one must dig deeper into how long specific tasks take.

$$\text{Labor Productivity} = \frac{\text{Quantities Installed}}{\text{Working Hours}}$$

The Project Productivity Metric

With a slightly different take, the project productivity method is also recognized as an acceptable method for measuring productivity in construction. This metric differs from the Labor Productivity Metric by including the costs of all construction activities for a project as opposed to just the quantities installed.

$$\text{Project Productivity} = \frac{\text{Cost for Construction}}{\text{Working Hours}}$$

While it still can't account for all the variables that affect a construction project's productivity, it gives a little more insight into the profitability. It is, however, also quite broad in terms of specifying where costs come from and how many hours they take up.

Other Metrics

There have been a handful of metrics proposed by construction researchers who suggest that in order to reach accurate results, measurement of productivity must be multi-factored. Thus, the calculation becomes a more complex, step-by-step process, but still doesn't totally cover all the aspects to a project that have any impact on productivity. So despite a slightly more thorough view, the metrics still do not reach the desired outcome.

3.

How do we incorporate all of these factors into one productivity metric?

Total Productivity Metric

This is where the Total Productivity Metric comes in. The Total Productivity Metric, or TPM, essentially combines all of the factors discussed prior, but does so in a way that considers the specificity of different tasks and jobs. By creating a ratio of tangible input to tangible output, you get the most precise, accurate measurement of productivity on your project. TPM does not factor in intangible input, such as effort levels, materials quality, and technological advancement.

This metric is a proposed method to get the most accurate representation of project productivity, which describes six types of input, and incorporates four separate phases of a project. Within the phases, you can gather the appropriate data on the input, and ultimately calculate the total productivity of the project.

Input Categories:

Labor input

Labor input is present in every stage of the construction process. Simply put, labor is manpower utilized in the project.

Owner cost

Owner cost is also a part of each phase in a project. Owner cost includes any expenses the project owner spends to make the project operable that do not fit into labor, materials, or energy.

Material input

All materials that are used in the actual structure being built fit into this category.

Capital input

In terms of productivity, capital input involves the costs of renting and insuring all equipment required to complete a project.

Energy input

Any energy consumed for a construction project is considered energy output. This means that energy is not considered as an overhead, but actually a separate input component when measuring productivity.

Construction project indirect cost

Indirect costs refer to any costs for a project that aren't directly contributing to the final result, such as parking, housing, temporary structures, and utilities.

Calculating the Total Productivity Metric

Phase 1.

Planning and design

- Labor
- Owner Cost

Phase 2.

Procurement

- Labor
- Owner Cost

Phase 3.

Construction

- Labor
- Material
- Capital
- Energy
- Indirect Cost
- Owner Cost

Phase 4.

Commissioning and start-up

- Labor
- Energy
- Owner Cost

Divide by total output

The Total Productivity Metric

For example:

Say your job is to build a 20 mile stretch of highway. As you go about the project, record all input in regards to the resource. Upon completion, add up all input factors, and divide them by the end result output, which in this case is the 20 mile road.

1. Calculate Input

\$80,000	Labor
\$100,000	Owener Costs
\$40,000	Materials
\$60,000	Capital
\$30,000	Energy
+\$20,000	Indirect Costs
\$330,000	Total Input

2. Divide by Output

\$330,000	Total Input
<hr/>	
20	Miles

3. Outcome

\$16,500 per mile

4.

What are the challenges with the Total Productivity Metric?

The technical issue is that even though the Total Productivity Metric gets us as close as possible to the most accurate measurement for productivity, there are still ways in which the metric can be utilized improperly. Like many aspects of construction, getting accurate data for the Total Productivity Metric starts within the field.

Although TPM is more comprehensive than other productivity measurement theories, there is still a high risk for miscalculation. With so many input factors incorporated into the four project phases, any missing or incorrect information can completely skew the results.

Say someone spills coffee on a notebook filled with data on all the quantities installed for the week, or a binder gets lost in the shuffle of moving files from the trailer into storage. Any chances of getting accurate productivity measurements from that entire project are gone in an instant. Physically storing information on pen and paper is a recipe for disaster when it comes to measuring productivity on construction projects, and any mishaps can lead to major delays or errors in a project.

Accurate field data collection is quite possibly the most important piece of the puzzle for measuring productivity, and in construction, this has been a problem area for centuries. Because the industry is notorious for its aversion to new technology, it should come as no surprise to

anyone that at least half of current construction projects are still utilizing manual data collection methods.

With an abundance of digital data collection tools available to the masses, you'd think that major global industries like construction would be quickly adopting any software that would help make projects more efficient. Unfortunately, implementing new tech has been quite the challenge in construction, but the construction software market is expanding rapidly. With new construction software programs that offer easy-to-use mobile apps, leaders in the field are seeing the benefits that can be gained from ditching pen and paper.

Consider the Total Productivity Metric. It starts with collecting data throughout the duration of a project. Within the six input categories, there are a ton of components that factor in, and all of those parts need to be included for the results to be accurate. When adding up all the input costs, it's much easier to access data that is stored in one easily searchable location. Then, all you have to do take your combined information and divide it by the tangible output. **With proper data collection, calculating productivity is fast, simple, and painless.**

Track Your Production in Real Time With Technology

In addition to speeding up reporting and communication, a major benefit of adopting mobile technology for field management is that you can track production in real time. This means that all project progress is automatically logged in an accessible online database, and stakeholders can receive updates from any location. You also can quickly assess productivity statistics and determine whether or not to make any workflow changes. By making data-driven decisions, you are giving your project a greater chance to reach completion on time and on budget.

The benefits of a mobile construction software solution extend beyond the jobsite. Those who can't physically be present onsite are able to see progress on projects from anywhere in the world. If there are specific issues that a project manager or engineer has to address, they can take care of it remotely, without needing to fly or drive out to a jobsite. If insights and data are accessible from the web, project stakeholders can get a clearer view into the productivity status of a build.

From a database of comprehensive production insights, you can gather all the proper components necessary to accurately consult the Total Productivity Metric. When you record information with a mobile field management tool, each input factor is accounted for, so your results are as precise as possible.

Use the Past for the Future

By recording information as you go, you can make sure that every detail of a project is stored in a searchable database. With your data safely kept online, there's no need to worry about important info getting thrown out or damaged. This way, in case of any future issues or questions, you can instantly pull up production data and negate legal disputes and maintain business relationships.

Tracking production is not only helpful when referring to past projects. One of the greatest advantages to having easily accessible production information is that estimators can build better bids for upcoming projects. With the bidding process, the more background information you can provide, the more likely you are to win the job. Nothing proves a company's capabilities more than results from a prior project, and the proof is in the data.

5.

So is the construction industry really productive?

While the construction industry may not be performing at peak efficiency just yet, it is possible that projects are running more smoothly than it seems, and inaccurate field data collection has affected the measurement of productivity. By incorporating new technology into your field management workflows, you will not only help projects run on schedule and on budget, but also, all field data will be properly recorded in an accessible database. Then, you can assess the project's productivity following its completion, which will help with planning future projects.

As a proposed solution, The Total Productivity Metric incorporates six major input categories. In order to get an accurate depiction of productivity in a project, it is important to factor in all of these types of input --- otherwise, your measurement won't have an exhaustive overview. By combining modern field data collection tools with TPM, construction professionals will be able to assess problem areas and trends across projects, thus building a more productive industry overall.

It is crucial to continue measuring productivity on a comprehensive scale because as construction projects grow in complexity, productivity matters even more. With so many factors that go into a project, it's no wonder that productivity has been such a difficult concept to measure. However, now that there are digital tools available to assist with measuring productivity in a way that incorporates all input factors, it is likely that productivity will improve exponentially on construction projects in the near future. With so much smart construction technology at our fingertips, there's no reason to drag our boots. **Let's get productive!**



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