Measuring Construction Productivity

Why You Can’t Measure Construction Productivity

Construction productivity is notoriously difficult to measure. In sharp contrast to the manufacturer whose productivity can be measured in a stable and consistent environment, the construction contractor is faced with a world that will not hold still. The problem of productivity in manufacturing often stems from monotony. The problem of productivity in construction is the reverse—infinite variety.

Picture a worker on an assembly line putting caps on bottles day after day. A cost engineer uses his stop-watch to measure that manual operation and makes his productivity improvement suggestion: Gravity-feed the caps from a dispenser immediately above the line instead of next to the line in order to eliminate two-tenths of a second from the unit production time. Cost engineers measure productivity in this way—by the tenths of seconds of time taken out of manufacturing operations. But what is the cost engineer actually measuring? Boredom. The operator is usually bored and must have an artificial stimulation—a new feeding device, in our example—in order to maintain the level of interest in the work that is necessary to do a good job.

Now picture a construction site. Trucks get stuck in the mud. Releases from engineering arrive on the site somewhat randomly. Materials spill off the sides of trucks into the mud. Permits are not released because of some minor technicality at city hall. Laborers don’t show up for work. A wind storm blows down an entire wall of pre-engineered panels. Foremen feel fortunate if they don’t have to use the bail bond money that they keep handy. Dozens of changes by the owners are ordered. Material may or may not arrive. Subcontractors are hard to control. General contractors don’t coordinate subs well. Inspectors don’t understand their own regulations. And on, and on, and on.

Construction and manufacturing do share some common problems in their environments: equipment, for example. Both the manufacturer and the contractor know that their productivity on the job is dependent upon equipment that continues to operate in spite of operator errors. The contractor faces an even tougher equipment operation problem when weather affects equipment performance.

A final equipment problem lies in the sheer availability of equipment. If a contractor is doing an out-of-town job, he may call ahead to see if the local equipment rental shop has a front-end loader of the correct size. Thirty days later when the contractor arrives at the job, he discovers that the reserved front-end loader is in the shop for an unexpected repair, and there are no others available. Now he is faced with a loss of productivity due to the lack of available equipment.

Manufacturing’s cost engineers, like contracting’s architects/specifiers, often specify substitute materials at the last minute. But, whereas a cost engineer may change his materials, he will generally change them less often than a specifier. When materials change,
applications change. The foreman and his crew may not know how to fasten a new type of panel because it requires the use of a different tool. Tools and tooling problems occur in both industries. Manufacturing tooling programs tend to be set up for five- and ten-year periods but require changes in operator assembly. Contracting’s tooling changes from job to job. Moreover, the tools that the contractor uses to apply the materials may well cause a slower productivity rate on some materials and a faster rate on other materials. Contractors must continually review their tooling programs for each job.

Weather further compounds contractor problems created by changing materials. A new material may require special storage. This fact may surprise a foreman who is accustomed to using material that he can cover with a tarpaulin at the end of the work day. How often has good material been lost because workers don’t know how to care for it on the job site properly?

When a contractor changes materials, he often changes the equipment with which he handles those materials. Consequently, an operator or a foreman may be unfamiliar with how to use the equipment for a given job. This unfamiliarity requires that each job have prejob training built into it. In a manufacturing environment, the training can often be longer term. A manufacturing operator who has learned how to use a drill press may well use that very piece of equipment for five or ten years; a construction operator may change the type of hoist that he is using to lift sheet rock twice during a year.

In sum, the construction environment conspires to drive an academically trained cost engineer who attempts to measure construction productivity right back to manufacturing. And everyone concludes, “You can’t measure construction productivity.”

Customization, Standardization, Creativity

All of these examples point to the fact that construction is a custom business, except in those cases in which manufacturing methods have been introduced into the construction site. Some home builders use a manufacturing approach to residential home building. Some apartment builders have built sub-assemblies, as would be done in manufacturing, and deliver larger components to the site for installation with a crane. There is a trend in construction to imitate the manufacturing floor approach. Indeed, if the contractor is to measure productivity in construction and improve it, we will have to find as many ways as possible to decustomize the business, while at the same time providing the uniqueness that each owner wants.

Some technologies of recent years suggest “standard customization.” Automation is a good example of a technology which can produce “standard customization.” In manufacturing environments, a manufacturer can build sub-assemblies and, with the use of a computer, assemble a custom-made automobile for a given dealer in a given state. The customer can punch in options for “customization” at the dealer showroom, while the manufacturer is building “standard” components which are assembled into the customized package. Standard customization will be useful in construction with increasing frequency. It is made possible by automation.

One of the positive features of automation for construction will be the ability to build custom buildings at a lower cost. This will be possible because sub-assemblies can be built in manufacturing environments, sorted and shipped, and then plugged into modular buildings. Even then, productivity measurement will have to cope with the changing technology which sub-assemblies represent. For example, in one job a crane may be the desired method of getting modules to upper floors, whereas on a job having fewer access problems, the outside elevator may be the desired way to get modules to higher floors.

Whether customization or standardization, measurement of productivity in construction must provide flexibility to cope with the continually changing circumstances that are being measured. It may mean factoring in unusual circumstances such as weather so that workers are not penalized by the fact that their hands are cold and they cannot work at optimum speed. Indeed, it is important to realize that measurement of productivity is only part of the management perspective on any job. The great advantage of
having human managers instead of computer management is that a human can cope with variety in ways that may not be programmable. A human can also be creative; a computer cannot.

One way to improve productivity on a construction site is for the foreman to walk away from the job, sit down on a stump, put his chin in his hands, and think. An owner walking by and seeing the foreman sitting there thinking might well conclude that the foreman is lazy. But he is trying to think of a way to work smarter, instead of spending extra money doing it the hard way. Every manager needs to take this creativity factor into account and organize jobs so that creativity is encouraged. **Creativity means not confusing hard work with smart work.** The path to productivity comes from improving the method itself rather than just working harder at the present method.

**Increasing Productivity**

How does one increase worker productivity as one is measuring it? Let’s review the basic fundamentals for increasing worker productivity.

**First, everyone in the company is a worker—management and labor.** In the last two decades of the twentieth century, hourly workers will recognize management’s work as significant. At the same time, managers will recognize the importance of management functions such as decision making, planning, coordination, and goal setting in the jobs of hourly workers. Managers will be considered as a different kind of worker. Managers are accustomed to being measured by profit and loss statements. Now managers can apply productivity measurements to themselves as workers. Workers, on the other hand, have some experience with measurement already. Piecework, direct payment based on the number of pieces produced, is familiar to labor. Using the P factor and the sampling method, both management and labor will be measured as workers. Improvement in productivity must be the concern of and occur at every level of the organization.

**Recognize that Profit Is Everybody’s Business**

**Second, profit is everybody’s business.** This responsibility used to be reserved to management; it must now become the responsibility of labor also. Workers must understand how their work hurts or helps profits. Introducing a measurement system that the workers use on themselves forms a basis for profit or loss responsibility, right down to the individual worker level. Managers can do the same. This profit self-responsibility will provide a way to introduce efforts to improve profits throughout the organization. If an individual worker knows that profits and losses are now apparent to everyone, peer pressure alone will cause him to think about smarter ways to work. Remember, we tend to work smarter and achieve productivity gains through intelligence more than sweat.

**Use Teamwork Throughout The Company**

The third fundamental for improving productivity is the use of teamwork throughout the company. Profit results from the intelligent use of everyone’s experience. This pooled experience must be identified and captured. Teams become measurable units. On the job site they have been called crews. We might call them business units, but they are groups of people engaged in teamwork, and they can measure their productivity simply by taking the cost of their labor (the denominator) and the work put in place by their team (the enumerator) and discovering the team P factor. This data will form the basis for challenging the team with goals: “Okay, we are running at a P factor of X. How can we get to X + 3?” In the past, goals have been clouded by the uncertainty of not knowing what is reasonable. Now the baseline—the P factor—that is developed by that individual crew or team will be viewed as fair because the team is not being compared to anyone but themselves. And people like to challenge them-
selves. They like to have the challenge from management, and management likes to have the challenge from stockholders to do better against baselines.

Set Business Goals For Everyone

The fourth fundamental necessary for improving productivity is this: everyone should set business goals. Set up sub-businesses within the company and treat them as if they were real businesses. These sub-businesses set normal business goals. These goals can be both short-term and long-term. Everyone participates in setting the goals, and they strive to achieve a certain output rate or productivity rate in those goals.

Remember that productivity output includes quality, and goals should always include quality. It is important to charge back to any business unit any quality failing so that quality consciousness becomes as important as speed of production.

When an incentive program is adopted if it is chosen, it is best to have a group incentive so that the whole team benefits. By working smarter, the team might receive some portion of the cost savings by which it beat the estimate. These methods have been tried by many contractors, and they have been satisfactory so long as the incentives were clearly spelled out and the workers could see that they were not penalized by factors beyond their span of control.

When verbal appreciation is used, it should always be specific. For example, the masonry crew discovers that by placing the water can on the scaffolding it increases the P factor each day because the crew is able to place ten more blocks per hour instead of having to climb down for water. This specific productivity gain idea is cited by the foreman when he gives praise in his team huddle.

Ask Labor How to Do Work Smarter

The fifth fundamental for increasing worker productivity is this: foremen should routinely ask everyone they supervise how the work can be done more intelligently. This line of questioning should be part of the foreman’s job description. The way he does it is also important. He should treat each worker with dignity and respond to his suggestions promptly. This prompt will help him improve the productivity of his crew by keeping it on their minds. He challenges them to become more productive by the very fact that he is constantly asking them for their ideas on how the job can be done smarter.

Provide Frequent Feedback

A sixth way to increase productivity is for foremen to give frequent feedback on performance. The emphasis here is on frequency of response, and the measurement program should provide this basis for frequency. Traditionally, contractors have had little data to give feedback to workers on productivity. It is important in measuring productivity to think about the program as a productivity improvement program at the same time, and in this context the program must be positive. A good rule of thumb is: 80 percent of the feedback to workers on average should be positive and no more than 20 percent negative. Negative means correcting for mistakes, not being sarcastic. Respond immediately after measurably good performance, and respond immediately to measurably poor performance.

Plan and Coordinate All Work

A seventh fundamental for increasing worker productivity is improved planning and coordination at all levels of the organization. Planning is probably the most important single factor in improving productivity. The planning of a standardization program can occur in a company’s home office, but it is also appropriate throughout the organization, including the individual worker. He will often have ideas on tools that should be standardized.

It is also important to get individual workers involved in the planning and coordination process. If a worker spends some time each day planning his work, he will more than offset the loss of productivity by the work that he doesn’t have to redo and the work that he does more intelligently.

Every worker should also have a personal time management plan. This plan can be made by keeping a log of how time is used by each person in the company for a few days, a simple self-tracking of his or her time usage. Self-tracking can be a surprise! It provides a basis for looking at the amount of work being turned out per man-hour invested in work. The point of the log is to have an estimate of what is done during each segment of time. Again, the use of self-tracking time management devices, such as the log, serves as a productivity improvement device by simply keeping it on the mind of the worker.

Develop a Materials Handling Plan

A major element in increasing productivity is the material handling plan for each job. Every job should have a material handling plan posted in the job trailer, including a site plan which indicates where drivers should put materials. This site plan helps prevent moving materials around the site. It also means that we can measure the effect of unplanned materials movement on productivity through the P factor.

Mechanize Wherever Possible

The ninth principle for productivity improvement is to recognize and auto-
mately whenever possible. One way to research automation is to invite vendors and specialists to assist and involve workers in the discussion of such topics as tools, fixtures and equipment.

Using vendors and workers to measure cycle times, the contractor gets ideas in the use of new technology and maximizes existing technology.

Demand Excellence

The tenth way to improve worker productivity is by having management at all levels, including foremen, demand excellence in both quality and quantity. Demands by their nature are goals in the form of a challenge. Research on the impact of demand on organization shows that when you ask for more, you get more. Now that the contractor has a measurement system in place, it has a way to define what more means. While workers are challenged to measure themselves and improve their own productivity with imagination and creativity in team huddles, management does not abdicate its responsibility to demand high quality and high quantity. In other words, excellence permeates the organization.

Invest in Training

An eleventh fundamental for increasing worker productivity is to invest in training. Train some crews and not other crews, and measure the impact of your training. Train the management of some jobs and don’t train management on other jobs and measure the difference. Remember, the focus of training is to improve productivity. Sometimes it takes time for training to have its impact. Use what is called patient money to invest in training. One of the greatest weaknesses of American management is its failure to think in terms of long-term investment. A patient investment waits for its return.

Invest in Research and Development

The twelfth fundamental is closely aligned with the eleventh: Invest in research and development. Now that we have a way to measure productivity in construction, we need to research doing things in different ways.

Share Productivity Improvement Ideas

The thirteenth fundamental for improving productivity is the sharing of productivity improvement ideas. Each job site is charged with measuring and improving productivity: each is also charged with sharing with all other company job sites the findings that each has made in its measurement and improvement program. Set up a company-wide productivity coordinator to channel each finding from site to site.

Pay Attention to Good Work

The fourteenth fundamental of productivity improvement is paying systematic attention to good work. It is the nature of management not only to be impatient with training and research and development, but to be impatient with whatever pace happens to be occurring in the company. Reverse this habit. Systematically force yourself as a manager to give attention to good work, point out what people are doing right and not just what they are doing wrong.

Install Free Enterprise At Every Level

Finally, the last principle for improving productivity, which undergrids the entire process of measuring and improving productivity in construction, is: Install the free enterprise system at all levels of the organization. We have already said that sub-business units need to be established within the company so that cost, productivity, accountability and improvement can be measured. This is the free enterprise system at work. At least part of every person’s compensation plan should be conditional upon performance on clearly specified and measurable objectives. Improvement will follow directly from the installation of the free enterprise system, which you can now measure in your construction company.

An Action Plan

Measuring productivity in construction gives us a path to improve productivity. The obstacle to measurement has been overcome. Using analysis and sampling enables you, the contractor, both to measure and work to improve productivity. Establishing histories of company, job and job element productivity rates opens a new era for productivity improvement in construction.

Now you can begin to develop your own histories. At the same time, you should install the productivity improvement principles in your organization. Begin by distributing this CONSTRUCTION DIMENSIONS article to all persons who have supervisory responsibility in your company. Ask them to begin measuring productivity and reporting data on elements and jobs. This data will provide critical information: what are the most and least productive jobs and elements. Let each manager use analysis and sampling before he tries improvement tactics. Use tactics that suit your own organization. At quarterly or monthly meetings, each manager should share the results of these improvement tactics.