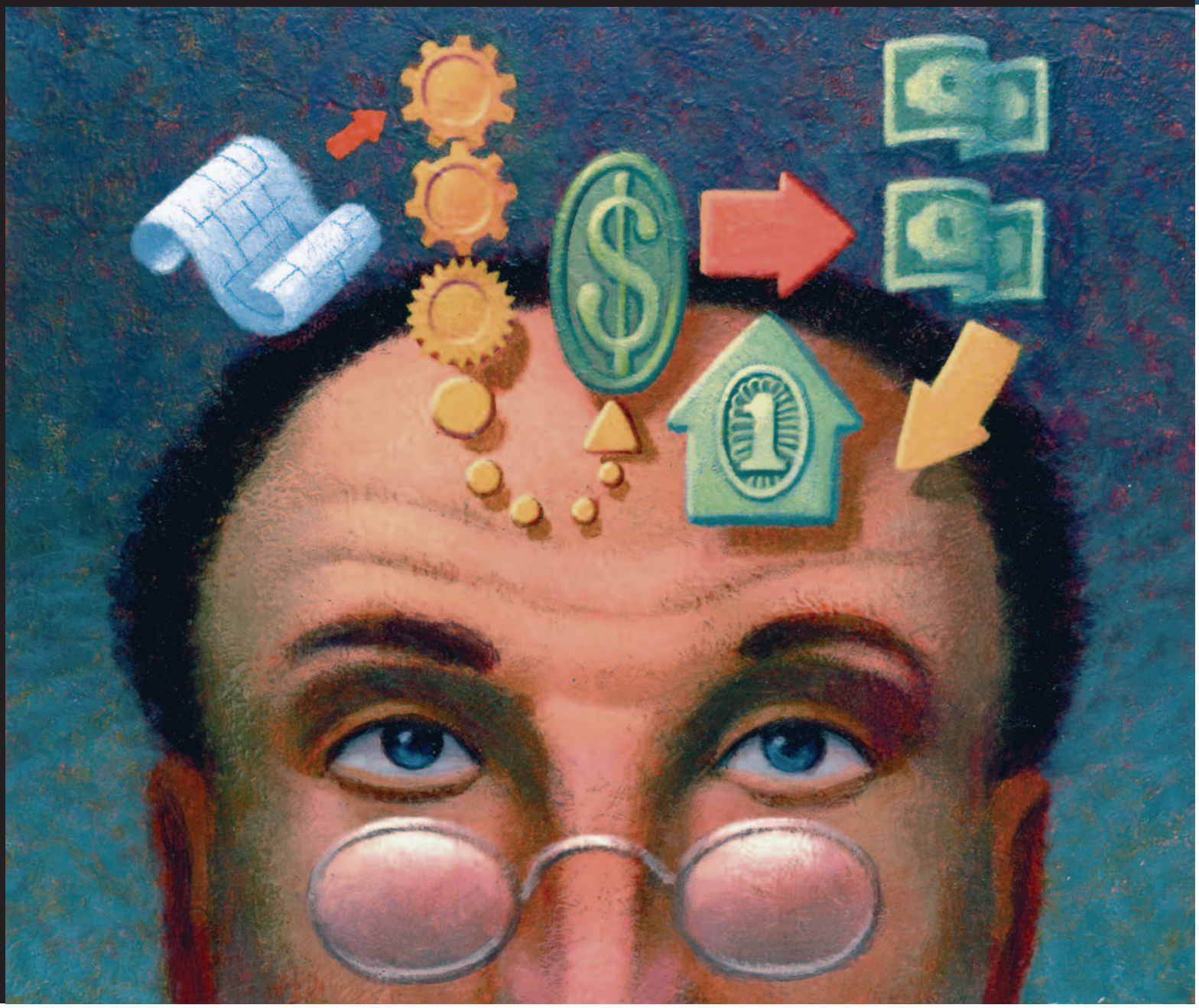


The IMPACT of JOB PLANNING on Profit$

BY PARVIZ DANESHGARI & MICHELLE T. WILSON

Every CEO, CFO, PM, and foreman intuitively knows that planning improves production. However, until now, no one knew why planning helped – or how much.

Based on 15 years of research, our data explains the relationship between planning, productivity, and profitability – and exposes an underlying weakness in the traditional accounting measurements of job progress.

Introduction

Using traditional accounting measurements to gauge productivity is like driving with only the rearview mirror to guide you. Here's the problem: Traditional accounting measures *production*, defined by construction-put-in-place and measured by earned revenues. Production measures the cost of completed work – it doesn't address efficiency.

On the other hand, *productivity* measures labor's productivity and effectiveness; it evaluates observed percent complete and analyzes whether expected profits are above or below expected earnings.

By measuring productivity, contractors can measure work more effectively, and as such, make more informed decisions. Each day, contractors make decisions (predictions) on whether or not to bid work, hire labor, schedule material shipments, and much more.

Consistently making these predictions come true requires planning. After all, the success or failure of the company hinges on the quality and accuracy of every decision.

Here is the underling assumption of this article: Making accurate predictions requires a new model based on project planning and productivity measurement, instead of the traditional accounting measurements of production.

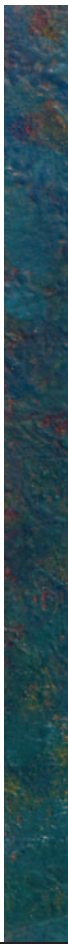
Project Planning

Our data shows that every hour spent in planning yields up to 17 hours of savings at the end of the job. Despite the efficiencies and substantial savings, many contractors are reluctant to fully plan.

The main reason given for lack of planning? Because schedules change. However, schedules are supposed to change. Schedules are made to change; they are change management tools. They change to respond to shifting circumstances on the jobsite, while organizing the details needed to accomplish the plan.

In construction management, planning and scheduling serve different purposes. Plans outline how the work will be accomplished. Planning allows contractors to minimize risks at both the company and project level, and to profitably complete the work on time and on budget. In spite of schedule changes, the plan needs to proceed.

Recently, *Lean Construction* has been celebrated as the new fad among construction management gurus. In reality, it is not leanness that matters, but rather agility and responsiveness to change. *Agile Construction* allows contractors to react to daily schedule changes and to stay ahead of the curve.



Our model focuses on the four spheres of construction planning that contribute to Agile Construction: **1)** the hand off to project management, **2)** job layout and value engineering, **3)** procurement planning, and **4)** short interval scheduling.

The Hand Off to Project Management

A contractor may take two weeks to estimate a two million dollar project. The actual time needed to pass the information to the field? Usually less than two hours.

However, all the valuable information gathered during the estimation phase could go unused if the contractor does not follow a structured approach to the process of project management. According to our research, a generic eight-step process of project management efficiently structures information flow at the outset of project award. (See Exhibit 1.)

Job Layout & Value Engineering

The most important part of a PM's role is job layout and planning. Two tools help ensure a predictable outcome: *Value Engineering (VE)*, a practice of re-evaluating the construction plan to reduce costs, and *Job Productivity Assurance and Control (JPAC)*, a cost tracking model we introduced in our "Customer Positioning Model for Contractors" article in the May/June 2005 issue of this magazine.

JPAC differs from the standard accounting approach for the measurement of job progress – it measures day-to-day labor productivity vs. a set construction budget goal. We'll talk more about JPAC later.

Procurement Planning

One of the most often missed steps in project planning is the procurement plan. Exhibit 2 shows the six steps necessary for an effective procurement plan.

Failure to have the correct amount of the correct material at the correct time and location significantly affects both productivity and cost. A responsive procurement plan helps maximize labor's contributions to profitability.

Short Interval Scheduling

As part of the job kickoff meeting, contractors should look ahead to each task's labor and material requirements. This concept, called *Short Interval Scheduling (SIS)*, allows contractors to react to project changes with increased agility and responsiveness.

Many years of data and a recent study for the Electrical Contracting Foundation, a research foundation for the National Electrical Contractors Association (NECA), proves that *the ideal jobsite inventory is three days of material*. According to the same study, *labor allocation is also most effective in three-day intervals.*

In addition, SIS validates JPAC productivity measurement and identifies the root causes of special events on the job. And, SIS is simple. Workers schedule their work for the next three days. Then, the PM scores the schedule on a daily basis, points out deviations from the schedule, and identifies the root causes for each deviation.

Exhibit 1: The Process of Project Management

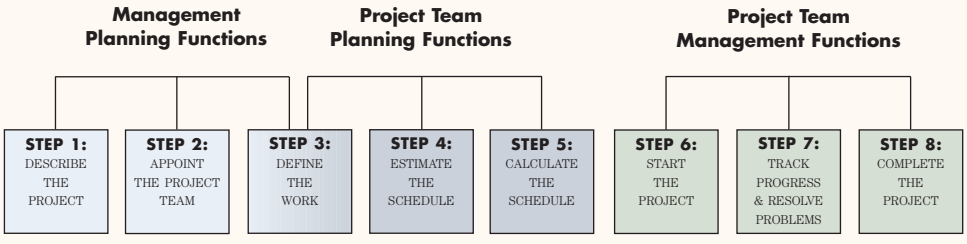
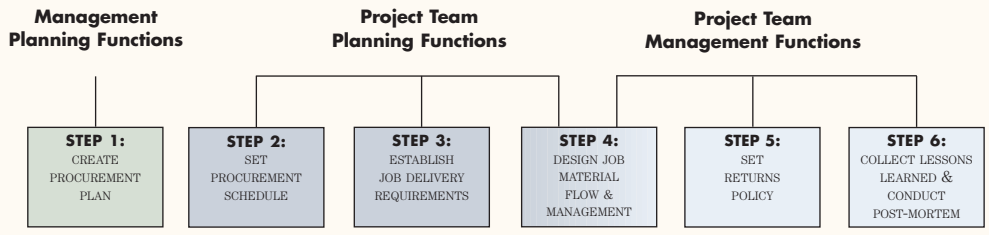


Exhibit 2: The Process of Procurement



Correlation of Planning & Productivity

The run-chart is key to jobsite productivity measurement; it not only tracks the "how" and "what" of productivity, but also indicates how to react to it.

Measuring labor productivity using traditional methods allows hours to be moved from one cost code to another and obscures the productivity variance.

Either way, the contractor pays for eight hours of work. However, under traditional accounting methods, he will never know the productivity of each cost code. Often, productivity delays and their resulting impact are not recognized until the end of the project, when they are most visible and most costly.

Labor productivity must be tracked from the worker's perspective. Using only a few high-level company cost codes to define the activities performed, PMs can track and manage the job's productivity based on each worker's progress.

With JPAC, CFOs and PMs pull data from the field to track job resource usage, measure variances, and evaluate a variance's affect on profitability. So, management can address issues earlier – when solutions are less expensive to implement.

JPAC focuses on a job's variable costs, making them more visible. Breaking variable costs into cost codes and defining visible, measurable tasks, allows PMs to observe the progress of each task.

When a task requires more (or less) time than originally planned for completion, the variance needs an explanation. To qualify variances, foremen predict, schedule, and track deviations in terms of both labor hours and root causes.

As an ongoing measure, JPAC tracks labor productivity by combining the field perspective (the observed percent complete) with the accounting perspective (the hours charged).

JPAC predicts the job's productivity at the end of the job, based on current productivity rates. With JPAC, contractors can evaluate the variations in productivity, identify root causes, and determine if a root cause results from a "common cause" or a "special cause" that requires immediate attention.

By enabling the CFO and PM to visualize and monitor labor variations from the worker's perspective, JPAC identifies productivity variances early, and allows the company to respond in the most effective and immediate manner. Ultimately, JPAC helps PMs plan and manage the relationship between labor productivity and job profitability.

How JPAC Works

At the job planning stage, the foreman and the PM divide the job's allocated hours into cost codes. The cost codes should be high-level activity codes, applied consistently across projects on a company-wide (or division-wide) basis.

Different types of work may require a different set of cost codes, but each division should need no more than 15-20. Of those, each job will generally require 7-10 different codes. Too many cost codes at this level subdivide the project too finely, which permits inconsistency and also creates a reporting burden that does not add significant value to the project.

Next, the foreman and the PM subdivide each cost code into tasks. The hours assigned to each task constitutes the job budget, which should match how the worker will perform the work. (This budget may be calculated very differently than the bid estimate.)

Exhibit 3: Sample Task Breakdown

As this excerpt shows, contractors can define visible, measurable tasks to track productivity with JPAC. In practice, a complete task breakdown would be much more complex.

	Budgeted Hours (from Schedule)	% of Work for Cost Code	% of Work for Job	Observed % Complete	Actual Hours (from Time Sheets)
TOTAL JOB	**8,553**		**100%**		
Basement	**100**	**10.2%**	**1.2%**		
First Floor E	**240**	**24.6%**	**2.8%**		
First Floor W	**239**	**24.5%**	**2.8%**		
Second Floor	**93**	**9.5%**	**1.1%**		
Third Floor	**93**	**9.5%**	**1.1%**		
Penthouse	**212**	**21.7%**	**2.5%**		
COST CODE A	**977**	**100%**	**11.5%**		
Pre-Work	**120**	**8.4%**	**1.4%**		
In Slab	**750**	**52.6%**	**8.8%**		
Overhead	**525**	**36.8%**	**6.1%**		
Clean Up	**32**	**2.2%**	**0.4%**		
COST CODE B	**1,427**	**100%**	**16.7%**		

As shown in Exhibit 3, the task breakdown divides the work into small, well-defined, measurable pieces that reflect a worker's view of job progress – one room, one area, one wing, one phase, one operation at a time. Our research has repeatedly verified that *the best foremen visualize the job by specific tasks and only for a maximum of three days in advance*, indicating the task breakdown in JPAC should cover no more than 3-5 days.

The optimum size of a task varies with job size and the number of field personnel, but less than 500 hours, or 5% of the job, is often a reasonable starting point.

Such special activities as clean up may be broken out separately to help define the work. Finer subdivisions at this level assist with planning, without adding the burden of reporting, or requiring an accounting system capable of tracking hundreds or thousands of cost codes.

Each week, workers report the "Observed Percent Complete" for each task. These completed percentages are compared with the high-level cost code labor hours submitted weekly to accounting. If the observed completion outpaces the planned hours, the job is more productive. If the observed completion lags, so does the job.

Exhibit 4: JPAC Variance Pattern of Special Cause

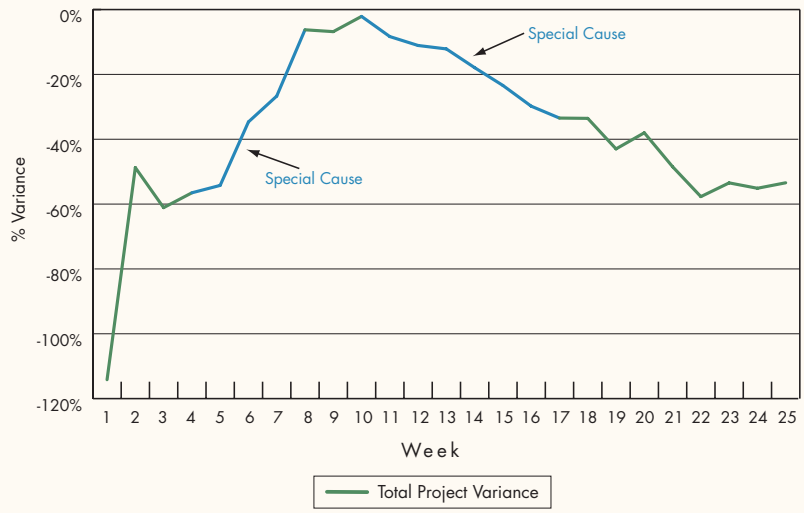
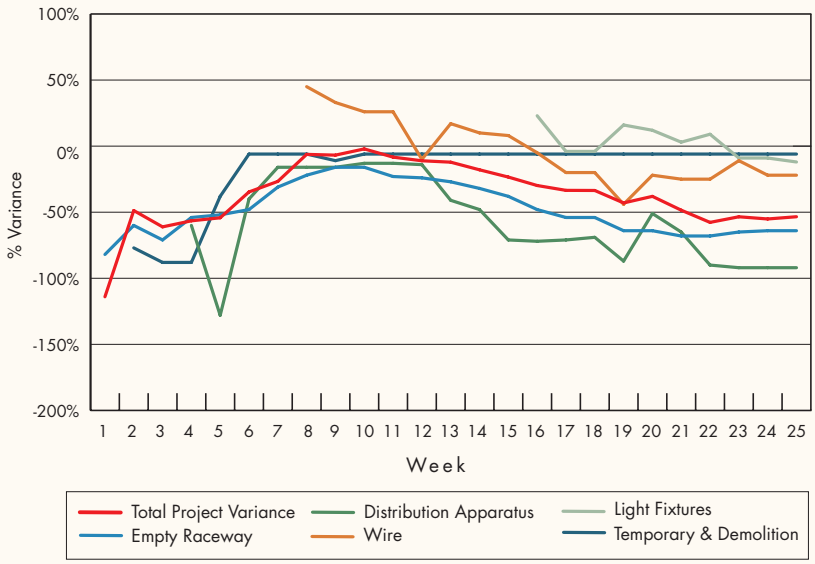


Exhibit 5: JPAC Variances by Cost Code



At this stage, the PM is measuring system productivity with JPAC, taking both the timing of events and all system inputs into account. JPAC also forecasts labor productivity to the end of the job, and allows the CFO to predict the job's profitability more accurately.

Exhibit 4 shows a job tracked with JPAC. The overall job shows the influence of special causes, evident in the upward and downward trend of consecutive points, each higher or lower than the last.

Since the job is no longer proceeding according to plan, the contractor will no longer earn profits according to plan. However, by examining the job at a cost code level (see Exhibit 5), the cost codes contributing to the productivity decline can clearly be identified and any issues speedily addressed.

Managing Variation

Measuring productivity without a tool for the timely recognition of variances is, at best, ineffective. Many believe that one of the main contributors to the success of the U.S. war efforts in World War II was the use of Statistical Process Control (SPC) among American manufacturers of war equipment.

W. Edwards Deming taught SPC and quality control to the U.S. defense industry. Classified as a military secret and known as Z1, this method reduced production variation and improved the quality of our nation's weaponry.

We recently demonstrated the impact of variation on job productivity in "Impact of Variation on EC [Electrical Contractor] Profitability," published by the Electrical Contracting Foundation. Although the entire process for managing variation requires a far more in-depth explanation than can be provided here, the management of productivity variation is an important element of project management.

There are simple SPC signals visible in job productivity measurements that can help manage productivity variation.

How to Identify Variation

Variation is the difference between one occurrence and the next. In order to identify the telltale fluctuations and differences that happen between one occurrence and the next, the process needs to be both visible and measured. Five tracking signals indicate a need for special cause management:

1) A Trend of Five or Six Consecutive Points: Any trend in the same direction, either upward or downward
2) Shift of Mean: An abrupt change in average productivity
3) Appearance of Extreme Points: A one-time increase or decline in productivity
4) A Pattern of Saw-Toothed Data Points: A pattern of increases and decreases in productivity
5) A Lack of Reporting: No reporting or inconsistent reporting

These tracking signals indicate that the variation in productivity is caused by an outside influence. The PM needs to respond to these signals immediately – because, as variation diminishes, the CFO's ability to predict the job's profits increases.

How to Use & Measure SIS

The SIS is a foreman's schedule, established and measured by the foreman on a short-term basis. The foreman determines which tasks his crew will work on during the next few days, and the PM tracks the accuracy of the foreman's schedule.

Through this tracking, the PM identifies the factors that affect the pace of work, isolates occurrences, and quantifies the impact of unscheduled work. By identifying the factors that affect the pace of work, the PM can address the underlying causes and continuously improve the accuracy of the short-term schedules.

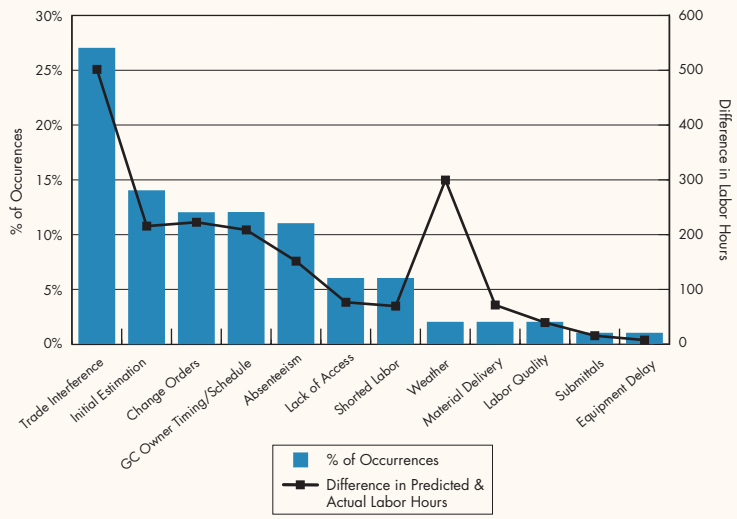
For instance, our research shows that trade interference is the number one cause of failure to comply with the short-term schedule. However, the most heard complaint from the field is that the materials are not available. There is a correlation between these two issues:

1) Interference or schedule changes from another trade postpones the planned work.
2) Labor and materials were only scheduled for the planned work.
3) Work crews cannot do other work because the materials were scheduled to arrive at a later date.

To avoid trade interference, labor squeezes, and material shortages, PMs should ask their foremen to look ahead three days using the following questions:

1) What did you do yesterday? Did you do yesterday's Plan A, Plan B, or Plan C, or did you do something else?
2) If you did not do yesterday's Plan A, why not?
3) What are your Plans A, B, and C for the next three days?

Exhibit 6: Predicted & Actual Labor Hours



4) What do you need to accomplish your plans (materials, manpower, tools, communication with other trades, etc.)?

By evaluating the foreman's responses to the previous questions, a PM can more accurately predict the job's material and manpower requirements, track the project plan, and improve communication between everyone involved in the project.

How to Correlate JPAC & SIS

Using SIS, PMs can detect the underlying root causes of productivity changes. When more hours are spent on any activity other than scheduled, job productivity declines. Conversely, when the job is worked as scheduled, and fewer hours are spent doing unscheduled or unanticipated work, or no work, the overall productivity on the job increases.

There is a direct relationship between unplanned hours as measured during the scoring of the SIS and job productivity, tracked with JPAC, over the same time frame. If the foreman cannot work according to the planned schedule, the job becomes less productive. On the other hand, if the foreman proceeds according to schedule, productivity increases.

Exhibit 6 shows how such SIS factors as absenteeism, weather, and equipment delays can impact labor hours.

Conclusion

To operate effectively, Agile Construction requires several components: job layout, project plan, procurement plan, project schedule, productivity measurement, short interval scheduling, and corrective action. With advance planning in each of these areas, contractors can significantly improve the impact of decisions and special causes on profitability.

Instead of the traditional approach, we advocate thorough project planning and accurate productivity measurement. To manage profits, costs must be highly visible. With JPAC and SIS, contractors can identify, monitor, and control variable costs – and improve profitability. BP

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