My Three Lessons on Craft Productivity

Keynote Presentation

E. Chris Buck
President
Productivity Enhancement Resources, Inc.

COAA WFP Annual Conference
Calgary, Alberta
September 19, 2011
Lesson 1: Breaking Down Productivity into Basic Elements

• Challenges are more easily addressed when broken down to basic elements.

• Craft productivity boils down to craft labor utilization.

• Craft labor utilization can be broken down to two basic elements:
  ➤ Craft labor utilization effectiveness
  ➤ Craft labor utilization efficiency

• Traditional productivity management tools measure craft utilization in a composite manner.
Lesson 1: Breaking Down Productivity into Basic Elements

- Items that impact craft productivity:
  - Execution Plan Quality
  - Craft Methods
  - Tool/Equipment Quality
  - Tool/Equipment/Material Access
  - Work Environment
  - Crew Coordination
  - Site Logistics
  - Estimate Basis
  - Staffing Levels
  - About 1000 other variables
Lesson 1: Breaking Down Productivity into Basic Elements

- Traditional productivity management/measurement methods is a composite of ALL these variables.
  - Declines in any variable or combination of variables takes this overall composite in bad direction.
  - Due to the volume of impactful variables, it can be difficult to zero in on root causes.
  - By combining traditional methods with a method to separate a portion of those variables from the others, it allows Project Management a way to more quickly identify and mitigate those variables effecting the project.
Lesson 1: Breaking Down Productivity into Basic Elements

- Historical data may indicate it takes 3.5 labor hours per linear foot of pipe to install.
- Estimate would show 100 LF to take 350 hours to install.
- The ratio of actual hours compared to 350 hours is how PF is calculated for that task.
- If the 100LF of pipe actually takes 375 hours to install, the PF would be calculated as follows:
  - \[
  \frac{350 \text{ hours}}{375 \text{ hours}} = 0.93.
  \]
  - Some companies measure PF ratio inverted. For the example above, the PF would be 1.07.
Using a Combination of Measures to Manage Craft Productivity

**PF vs Direct Activity**

- **Productivity Factor**
  - Jan: 0.8, 50%
  - Feb: 0.75, 51%
  - Mar: 0.72, 53%
  - Apr: 0.69, 53%

- **Direct Activity %**
  - Jan: 55%
  - Feb: 53%
  - Mar: 51%
  - Apr: 49%

**Legend:**
- Red line: PF
- Blue line: Direct Activity
Using a Combination of Measures to Manage Craft Productivity

PF vs Direct Activity

<table>
<thead>
<tr>
<th>Productivity Factor</th>
<th>Direct Activity %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.80 53%</td>
<td>55%</td>
</tr>
<tr>
<td>0.75 53%</td>
<td>53%</td>
</tr>
<tr>
<td>0.72 51%</td>
<td>51%</td>
</tr>
<tr>
<td>0.69 50%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Jan Feb Mar Apr
Lesson 1: Breaking Down Productivity into Basic Elements

• Every project should develop a comprehensive productivity plan.
  ► That plan should address how the project will manage effectiveness and efficiency on the project.
    → Will the project require certified craftsmen?
    → How to ensure tool and equipment quality is satisfactory?
    → Will there be supervisor training?
    → How will productivity information be used/shared?
    → How will efficiency evaluation be used?
    → How can craft travel be minimized or in some cases, eliminated?
    → Etc.
Lesson 2: Budgetivity

- Major industrial projects use estimate-based measurements to manage craft productivity.
- A 1.0 PF may or may not mean the project is performing productively.
- Technically, a 1.0 PF means the project is performing exactly as estimated/budgeted.
  - If estimate is tough or fat, it has as much or more impact on PF as performance.
Lesson 2: Budgetivity

Consider Two Projects

- **Project A**
  - Lump Sum
  - Competitively Bid with 4 Bidders
  - 2 Future Projects Planned By Client in Next 2 Years

- **Project B**
  - Reimbursable
  - Capital Project on an Evergreen Site
  - Sole Source Award to Established Contractor

Does an equal PF between these projects mean they’re equally productive?
Lesson 2: Budgetivity

Good “Budgetivity” Does Not Necessarily Equal Good “Productivity”.

- Commercial structure, Contractor financial position, local labor force and other factors and variables that may effect the project estimate.

- Productivity improvements will usually manifest in the PF as upward trends, but comparisons between projects shouldn’t be viewed as an “apples to apples” comparison.
Lesson 3: Foremen Availability

No Single Issue has a Bigger Impact on the Most Important Measurables of Construction Performance; Safety, Productivity, and Quality

- Managing foreman availability (FA) is more than improving the supervisor to craft ratio.
- Projects need to take a hard look at the roles and responsibilities of foremen.
Lesson 3: Foremen Availability

• If projects were to measure foremen availability, each would be able to draw clear correlations between increases and decreases to FA to respective Safety, Productivity and Quality metrics.
  
  ► What roles/responsibilities of foremen can be shifted up, down or across the chain of command to facilitate the optimum available time to their crews?

  ► Can foreman shacks be installed closer to the workface to minimize time away from crew for necessary admin duties?

  ► Is the project operating with the optimum foremen to crew ratio from a productivity standpoint?

• A Tri-partite Study was recently completed on the SER Project for Syncrude focusing on Foreman Availability.
SERP Joint Workface Study - A Tri-Partite Approach to Improved Performance

Niels Frederiksen - Jacobs
Robert Blakely - Building and Construction Trades
Iain Howieson - Syncrude
Background

- Productivity on the Syncrude Emissions Reduction Project was a concern.
  - Earlier quantitative “Time on Tools” studies had indicated high craft travel, low direct activity
  - Qualitative views had indicated low levels of foreman time at the workface

- In the fall of 2010, the Building Trades were approached by Syncrude to assist in funding a study on “Foreman Time at the Workface”

- A Tri-partite study was jointly funded by Syncrude, Jacobs, and the Building Trades
  - Conducted by Productivity Enhancement Resources Inc.
  - Baseline study in Jan/11. Follow-up study May/11
Findings

- **Baseline Data** - January 2011 results indicated foreman availability of 34.7% corresponding to direct craft activity of 36.9%
  - Foreman choosing to conduct administrative duties elsewhere
  - Time at workface not considered a high priority
  - Erosion of standards

- Joint improvement initiatives conducted to drive accountability and engagement
  - Communications and alignment of expectations
  - Logistics Improvements
  - Building Trades Business managers meetings with craft.
  - Positive feedback, recognition, and promotion

- **Final Data** - May results saw a 32% improvement in foreman availability to 45.9%
  - Corresponding 21% drop in craft travel time and 4% improvement in direct activity
  - Corresponding reduction in number of safety incidents and improved productivity
Direct Activity vs Foreman Availability

- Overall Direct Activity improved 1.4 percentage points (4%) during study period (36.9 to 38.3%)
  - Normally expect to see a decline in direct activity of 5.3% during this period of the project
  - Net improvement 9.3%

- A linear relationship was found between foreman availability and direct activity
  - Trades with lower foreman availability worked at ~ 35% Direct Activity
  - Trades with higher foreman availability worked at ~ 43% Direct Activity
Overall craft travel dropped 5 percentage points (21%) during study period (29.1 vs 24.2%) – Normally expect to see an increase in craft travel of 26% during this period of the project – Net improvement 47%

A linear relationship was found between foreman availability and craft travel. – Trades with lower foreman availability had ~ 31% Craft Travel – Trades with higher foreman availability had ~ 23% Craft Travel
Productivity vs Time

- PF rose from a nominal 0.75 PF to 0.86 PF, partially attributable to increased foreman time at the workface, resulting in greater direct activity and reduced craft travel.
- Productivity during the improvement period exceeded plan numbers for 3 out of 4 months:
  - May was impacted by environmental conditions (forest fire smoke).
Productivity vs Percent Complete

- Productivity levels did not follow the typical decay curves experienced on most projects
- PF levels continuously exceeded plan numbers during improvement cycle
  - Overall cost outlook reduced by $11M due to better than plan PF
Additional Observations

- Improved incident rates occurred, partially attributable to improved foreman time at the workface
  - Recordable injuries vs previous period reduced from 5 to 2
  - Total incidents reduced from 62 to 53.
- Project went 87 days with no recordable injuries during period, one of the longest stretches on the project
Summary of Findings

- Higher field presence of foreman at the workface has a direct relationship to increased craft work activity and to decreased craft travel.

- Improved safety and productivity performance on SERP during the study phase can be partially attributed to increased field presence of foreman at the workface.

- Joint participation and ownership of results by Owner, Contractor and Labour is key in improving the foreman time at the workface.

- Improved foreman training, role definition, and accountability is required to continuously improve craft performance.

- Implementation of efficiency metrics (Time on Tools) as a supplement to traditional execution measures has proven to be an effective tool in continuous improvement of overall project productivity.
Key Learnings

- Tripartite approach to problem resolution can create significant performance improvement if all sides are aligned to a common goal.

- Syncrude has always been a supporter of Building Trades and were pleased to see them actively pursuing improvements to increase their value.

- Ongoing, continuous improvement of craft productivity is essential to the success of the Oilsands Industry in Alberta and the Organized Construction Industry as a whole.
Our Common Challenge

The results of this study indicate that we can work together to improve foreman time at the workface.

However to obtain the maximum benefit, we must continuously improve until we consistently achieve 70-80% of foreman time at the workface.
Summary

• With so many variables impacting craft production, using tools to help break productivity performance into more basic elements assists project management in determining root cause(s), enabling them to act more quickly and effectively.

• While traditional productivity measurement methods are influenced by increases and decreases in productivity, their true purpose is to measure the accuracy of the estimate.
  - Project comparisons using traditional methods alone may not provide an equitable evaluation.
  - The best solution is to use a combination of traditional methods with efficiency evaluations (such as work sampling).

• No single item impacts craft safety, productivity and quality as much as Foreman Availability.
  - Projects should implement tools to optimize foreman time at the workface.
My Three Lessons on Craft Productivity

Q & A Session

E. Chris Buck
President
Productivity Enhancement Resources, Inc.

COAA WFP Annual Conference
Calgary, Alberta
September 19, 2011