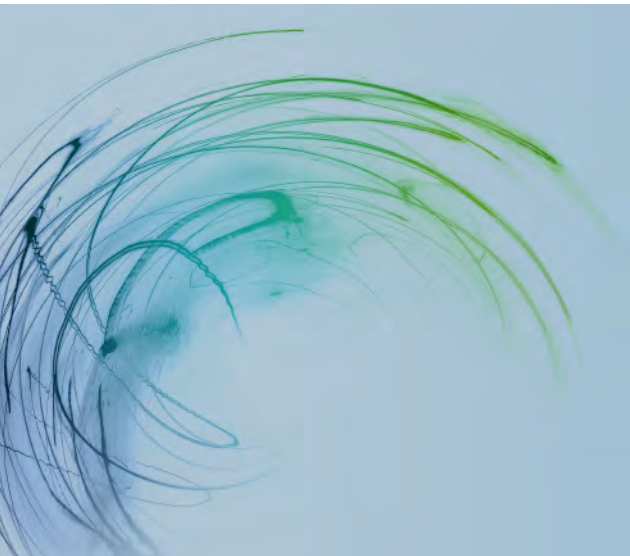
Final Report 340

Corporate Best Practices for Successful Productivity Improvement Programs



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Corporate Best Practices for Successful Productivity Improvement Programs

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Executive Summary

In the construction industry, productivity improvement is a critical aspect of successful project planning and execution. Specific productivity practices have demonstrated improvements at the activity, trade, and project levels; however, results have been inconsistent and the productivity gains have not been significant at the corporate and industry levels. This research by CII Research Team 340, Corporate Practices for Successful Productivity Improvement Programs (RT-340), studies the productivity improvement challenge from a corporate perspective, which influences entire project portfolios. The objective is to characterize and assess Corporate Productivity Programs, which are comprised of the people, processes, and technologies that support an organization's productivity improvement efforts. To this end, the Construction Industry Institute developed the essential research question investigated through this research, "What are the enterprise-level best practices for implementing productivity improvement programs; and what are the most significant barriers to their implementation?"

In pursuit of effective corporate-level programs to generate portfolio-wide impact, the research team leveraged existing programs in safety and lessons learned to understand roles, responsibilities, practices, barriers, and interfaces common among these established corporate programs. That basis gave support for a familiar program structure, like the measurable actions and tenets for success.

In identifying the best corporate practices and barriers for the successful implementation of productivity improvement programs, 94 Actions and 60 Barriers were identified based literature review, interviews with subject matter experts, and research team analyses. Actions are defined as measurable enterprise-level best practices of Corporate Productivity Programs that enable successful program management and implementation of proven productivity practices across company project portfolios. These Actions span many aspects of company business, such as, development of goals and objectives to focus company efforts, performance of project controls processes, and utilizing metrics for continuous improvement. The research team categorized these 94 Actions in six key Elements:

1. Leadership
2. Resources
3. Structure and Communications
4. Planning for Productivity
5. Productivity Monitoring and Control
6. Continuous Improvement.

RT-340 conducted surveys and interviews to validate the proposed Elements, Actions, and Barriers. At the end, the team developed an Implementation Framework to help organizations assess and improve corporate productivity program maturity (see Figure 1).

Figure 1. Implementation Framework

Executive engagement is critical to successful implementation of RT-340 findings. Because the Corporate Productivity Program seeks to improve organizations' full project portfolio, sponsors need authority and long-term commitment to drive improvement. With that influence, a company's Corporate Productivity Program is able to leverage the RT-340 findings. This begins with defining the program's roles and responsibilities, which are then assessed.

This structured program Implementation Framework enables corporate leaders to focus efforts and resources on key areas and specific company issues. Through identification of strong and weak program Actions, program sponsors can guide the improvement path and responsibilities. Additionally, identifying and recognizing likely Barriers enable mitigation of potential pitfalls specific to the company's program. These assessment processes enable implementation planning with program participants aligned on specific Actions, Barriers, and objectives that span across the corporate and project organizations.

Through improving the Corporate Productivity Program, a company should have increased utilization and consistency with implementation of proven productivity practices. Successful systematic implementation of these proven productivity practices can generate more reliable management of productivity efforts across project portfolios. These systemic productivity improvements have the potential to increase performance and predictability for portfolio management in the multi-trillion-dollar construction industry.

The report structure flows from defining and investigating the essential research question into how companies can leverage and implement research findings. Chapter 1 introduces the motivation and objectives. Chapter 2 explains the research process and data collected. The data is analyzed to provide research findings in Chapter 3. These findings are structured and tested as an implementable system, which is laid out in Chapter 4 and supported by Appendices A, B, and C. Finally, Chapter 5 summarizes the conclusions and recommendations that resulted from this research.

Contents

Chapter 1
Introduction

Motivation

Improving construction productivity has been a goal in the capital projects industry for many decades. Efforts include the implementation of corporate construction productivity programs to improve the project and business outcomes of an organization. Whether these endeavors have resulted in improvements in productivity is still non-conclusive. Previous studies demonstrated productivity improvements at the activity, trade, and project levels. However, results have been inconsistent and have not translated in significant productivity gains at the corporate and industry levels.

In other areas, such as construction safety, corporations implement enterprise-level programs that ensure projects are properly managing safety to company expectations. Industry safety metrics reflect decades of improvement as a result of focused, systematic, enterprise-level approach. If a similar approach is applied to productivity, organizations may be able to consistently implement proven practices and improve project and construction management. These improvements could result in improved portfolio management, project performance consistency, and certainty of outcome. This would positively influence the effectiveness of trillions of dollars spent in construction around the world.

Research Objective

The main objective of this research is to develop enterprise-level best practices for implementing productivity improvement programs. In doing so, the most significant barriers to corporate productivity programs are also identified. Effective corporate productivity improvement programs should increase productivity practice utilization and success. The research intends to enhance companies' ability to identify and fill enterprise-level gaps that hinder construction productivity. The gaps will be identified and addressed by characterizing and enabling assessment of corporate productivity programs. These will be strategically outlined in an Implementation Framework.

Specific research objectives are:

- Characterize corporate productivity programs.
- Identify productivity practices used by organizations and assess the level of involvement of corporate productivity programs in the implementation and management of these productivity practices.
- Determine enterprise-level actions (i.e., best corporate productivity program practices) that should be executed by companies to promote the use of productivity practices
- Identify the barriers for successful implementation of these enterprise-level actions.
- Explore the impact of corporate productivity improvement programs on project and business outcomes

Effective corporate productivity improvement programs should increase productivity practice utilization and success. The overarching purpose of this research is to provide companies a method to improve corporate-level engagement and management of construction productivity to improve portfolio predictability and performance.

Definitions

The following definitions have been established to better describe the research:

Corporate/Enterprise: For the purposes of this research, corporate, corporate-level, and enterprise-level are used somewhat interchangeably. Each is defined as the organizational components of a company that acts in oversight or in support of multiple or all company projects. This level influences decisions of company leadership above capital projects in companies' organizational structures.

Productivity Practices*:* Practices that have been proven to increase construction productivity. Examples include constructability, activity analysis, training, and materials management, among others. Other studies confirmed that the effective and consistent implementation of these practices contribute to construction productivity improvements (Goodrum, 2013).

Corporate Productivity Program*:* The people, processes, and technologies within an owner or contractor organization responsible for the following tasks:

- Developing interfaces with corporate and project entities to improve productivity performance
- Defining the productivity practices that should be implemented on a project considering project specific circumstances and organizational objectives
- Providing guidance on how to plan and control the implementation of productivity practices
- Performing corporate level measurement, analysis, control, and improvement of the implementation of productivity practices across projects

Actions*:* Enterprise-level best program practices that allow organizations to successfully and consistently implement productivity practices across projects, leading to productivity improvements.

Scope Limitations

Construction productivity can be viewed in multiple ways, but it is often measured as ratio of input work-hours to output product or ratio of direct work to total hours when managing worksites' direct work rates. However, due to varying types of work, products, reporting methods, and compensations, it is often difficult to roll-up to high reporting levels, such as project or company averages. This results in limited company data above scope-specific work to support a basis of best performing companies. Thus, the research to date does not address company or project comparisons.

Companies participating in the research primarily represent heavy industrial construction. It is assumed the company data in both surveys and interviews reflect the larger membership of CII's members. Research findings may not be applicable across the whole construction industry beyond CII's sectors. Data were not able to be collected for the entire construction industry, particularly residential or commercial construction companies.

Chapter 2

Methodology

Overview

The research approach that was established to address the research objectives is presented in this chapter. The approach is outlined in Figure 2.

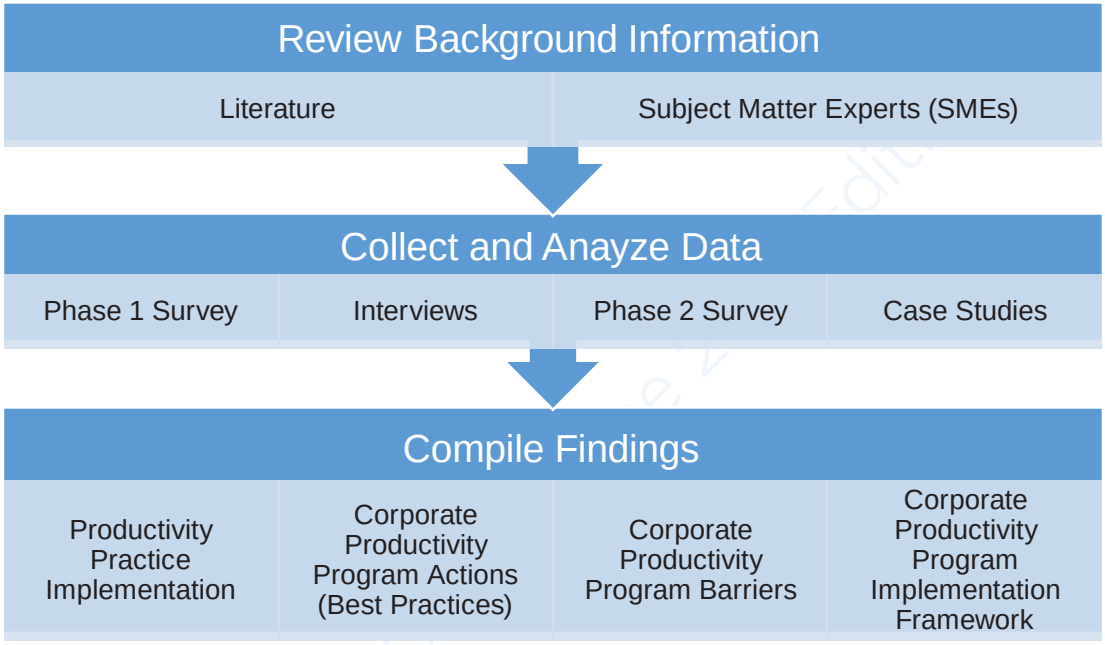

Figure 2. Research Methodology

Review Background Information

The background review involved literature analyses and interviews addressing the following topics:

Productivity Definitions and Metrics

Construction productivity is relatively well understood and is defined as the ratio of outputs to inputs for any given process. However, inputs and outputs measured and calculations performed vary widely across the industry. The first challenge for any productivity process improvement effort is to come to a common understanding of productivity. In the construction industry, many productivity definitions exist. Research Team 252 defined some key terms and reviewed many common productivity

definitions used at the trade, project, and industry levels. RT-252's research indicates that productivity improvement requires the following strategies and methods:

1. Increase the percentage of time spent by craft professionals on direct work.
2. Reduce the number of work hours required to complete one unit of work.
3. Reduce the amount of rework that occurs on projects.

These three approaches are not mutually exclusive. In fact, our research found that most corporate productivity programs combine the three. Further, the means and methods for implementing these strategies can vary significantly based on a host of factors, including specific trades, types of projects, and jobsite factors.

Factors that Affect Productivity

Productivity is influenced by many diverse factors, such as level of scope definition, planning, implementation of productivity practices, engineering readiness, resource availability, craft capability, technology, among others. CII Implementation Resource 252-3c, *Productivity Handbook*, discussed many factors influencing productivity, ranging from weather and operating plant conditions to overtime pay and absenteeism. Adverse effects for specific sets of conditions have often been quantified in the literature. However, adverse effects on productivity from these factors are not always inevitable. RT-252 conducted research on factors known to have an adverse influence on productivity from CII and non-CII sources. Its deliverables describe actions taken to mitigate the adverse effects of each factor using both quantitative and qualitative data. RT-215 investigated craft professionals' input and perceptions of the issues influencing their daily productivity. It recognized productivity factors affecting craft professionals differently with respect to their trade.

Practices that Improve Productivity

Several previous studies demonstrated various management practices that can improve productivity when effectively implemented. However, the level of implementation of these practices is low in many projects, leading to inconsistent results. Full knowledge of all the effective productivity practices rarely resides in a single individual or even a single project team. To help supplement a project team's productivity knowledge, the Best Productivity Practice Implementation Index (BPPII) was developed by CII as a quantitative measurement tool that helps project management teams understand and use practices that improve productivity. BPPII measures the planning and implementation levels of practices that have the potential to improve construction productivity and ultimately, aims to make construction projects more productive. For

instance, the BPPII for industrial projects consists of 53 best productivity practices that are organized into the following six categories:

1. Materials Management
2. Equipment Logistics
3. Craft Information Systems
4. Human Resource Management
5. Construction Methods
6. Environment, Safety, and Health

Technologies to Improve Productivity

Over the last few decades, the capital project industry has witnessed technological advances in the areas of materials, equipment, tool, information technologies, automation, and robotics. Improved equipment, such as autonomous earth moving equipment, advanced tools, such as “smart tools,” and new materials, such as self-consolidating concrete, can increase productivity at the activity level. However, the impact of such technologies on the broader processes of which they are a part is much harder to quantify. Several studies analyzed technology advancements and their impacts on productivity. For instance, RT-240 studied how to leverage technologies to improve construction productivity and developed a technology prediction tool that considers strategic economic factors, feasibility, usage issues, and potential impact as part of the analysis.

Workforce Aspects

Owners and contractors understand that a qualified workforce is extremely important to safety, cost, schedule, quality, and productivity performance. Workforce development and training to increase capability and quality are vital parts of productivity improvement programs. Construction professionals at different levels form the core of any organization and have a significant influence on construction productivity. In order to get a broader perspective of workforce issues and their impact on productivity, CII commissioned important studies. These included RT-215 that analyzed the workforce view of construction labor productivity and RT-330, which studied the role of frontline supervision in improving construction productivity and performance.

Productivity Assessment Methods

Productivity improvement requires measurements and analyses to assess productivity, identify productivity barriers, and recommend improvement strategies. Productivity data can be collected using quantitative and qualitative methods. These approaches can be categorized as:

- Process Observation – activity analysis and five-minute rating
- Interviews and Surveys – craftsmen questionnaire, foreman delay survey, and voice of craft worker
- Process and Resource Mapping – crew balance chart, flow diagram

Since most productivity assessment methods rely on labor intensive and manual processes, recent studies explored ways to automate the productivity assessment process. Technologies investigated included video cameras, laser scanners, and RFID tags.

Philosophies for Process Improvement

The manufacturing industry has experienced performance improvements since the development and application of lean principles, as well as the use of techniques like Six Sigma. Previous studies have indicated that the implementation of lean concepts may improve product costs, capital requirements, quality, cycle times, inventory, and space needs. These philosophies establish structure and disciplined approach to improving processes. CII, the Lean Construction Institute, and other research institutions have investigated ways to apply lean principles in the construction industry. RT-191 developed five principles of lean construction:

1. Customer Focus
2. Culture and People
3. Workplace Organization and Standardization
4. Elimination of Waste
5. Continuous Improvement and Built-in Quality

Lessons Learned from Other Corporate Programs

Although productivity practices are frequently utilized in construction, most companies do not have defined, formal systems for managing productivity at enterprise or company-wide levels. Project management teams habitually fail to apply known workforce management practices, and projects frequently run into the same issues generating negative project outcomes without long-term correction or intervention (Thomas, 2009).

However, other construction programs, such as safety, have had success addressing these large, industry-wide challenges (CII, 2017). The parallels focused by this research are corporate programs promoting long-term improvement and program management. Company programs provide a bridge for learnings to become a toolkit for portfolio-wide improvement (OSHA, 2016).

Productivity in construction faces a long history of lagging compared to other industries (Sveikauskas, 2016). Construction safety has addressed similar challenges with programs developed around company objectives and goals, and order of magnitude improvements have been seen over the past few decades (CII, 2017). The programs addressing those goals and objectives exists in order for companies to channel safety focus, resources, and learnings (Hinze, 2003; OSHA, 2016). In lessons learned programs, companies attempt to repeat positive experiences and mitigate repetitive mistakes. To do so, a program manages organizational or enterprise-level knowledge management systems and training to improve company-wide information flow and experience transfer (Caldas, 2009).

Construction corporate programs such as the ones mentioned above were assessed to identify systems, roles, and responsibilities that enable success at the enterprise-level. Additionally, the program management systems and measurement methodologies are reviewed. These detailed, measurable program frameworks and structures that are currently in-use and provide common industry terminology and references for the assessment of corporate productivity improvement programs.

Collect and Analyze Data

Phase 1 Survey

The goal of the Phase 1 survey was to enhance the team's understanding of the construction industry's utilization of productivity practices, and the impacts of Corporate Productivity Program Actions. The data were collected to assess the maturity of corporate productivity programs based on the Element–Action characterization. Specific productivity improvement practices that are being implemented as elements of corporate programs were investigated, and barriers to implementation of enterprise-level productivity programs were also questioned. This first survey influenced the direction of the subsequent phases of this research.

To check industry norms regarding the Corporate Productivity Program Actions, the researchers distributed a survey that asked participants to perform a self-assessment of their individual company programs. Participants were asked to evaluate their companies' performance for each of the 94 Actions. Through this self-assessment, individuals responded in terms of level of agreement that their company had

executed enterprise-level actions related to leadership, resources, communications, planning, monitoring, and continuous improvement to support productivity. Program characterization data were gathered from 51 survey participants. Companies surveyed were typically CII members. Thus, responses primarily represent owners and contractors from heavy industrial construction sectors.

Participants were asked to focus on corporate level commitment while assessing the 94 Actions within the program Elements providing context for the Actions level of implementation. They designated "Level of Agreement" with their company's corporate-level performance of each productivity improvement program Action. These responses were for each Action, utilizing a Likert scale of "Strongly Agree" to "Strongly Disagree."

Additionally, productivity practice utilization was investigated with each participant assessing his or her company's average use of productivity practices in the company's project portfolio by allocating each practice to one of five bands:

1. Practice used on 75% or more of projects
2. Practice used on 51–75% of projects
3. Practice used on 26–50% of projects
4. Practice used on 0–25% of projects
5. Practice not utilized

Individuals could skip a question if the company's utilization of that practice was unknown to the respondent. The survey also investigated the use of metrics to track the level of implementation of these productivity practices and their impact on productivity.

The level of involvement of corporate productivity programs in the implementation and management of these productivity practices was also questioned. This data enabled understanding of current utilization levels of practices across companies, and allowed for the analysis of relationships between Corporate Productivity Programs and proven productivity practice utilization. This allowed comparison of successful and unsuccessful Corporate Productivity Programs by evaluating how productivity practice implementation is impacted by the characteristics and maturity of varying corporate programs.

Programs' Scores were calculated based on the survey responses. Companies were split into two groups based on their scores:

- Group 1, or "Higher Program Scores" – upper 40%, N=20)
- Group 2, or "Lower Program Scores" – lower 40%, N=20).

(The middle 20% was dropped to create a clear gap between high and low scores.)

Respondents estimated each practice's utilization across project portfolios by assigning it to the familiar five bands (i.e., Practice Not Utilized, 1–25%, and so on). Using Kruskal-Wallis non-parametric assessment, the researchers checked the Program Score groups against the utilization of productivity practices. Twenty-five productivity practices displayed Group 1 (higher scores) having higher utilization of practices at a 0.10 significance or better.

Interviews

Interviews with selected organizations that participated in the Phase I Survey were conducted to further analyze corporate productivity programs. A total of 18 interviews were conducted. An interview guide was prepared by the research team and sent to the interviewees prior to the interviews. Interview were approximately one-hour in length and were primarily with individuals who completed the Phase I Survey. The typical company represented one of four CII Sectors:

- Power, Utilities, and Infrastructure
- Downstream and Chemicals
- Upstream, Midstream, and Mining
- Manufacturing and Life Sciences

In some cases, the subject company worked across more than one of these sectors. Participants were mostly in corporate positions, managing or coordinating support for multiple projects, and their experience in projects and operations ranged between 10 and 30 years.

During interviews, the researchers sought to conduct a more in-depth investigation of the subtle implications of different implementations of corporate productivity programs. These interviews targeted both business and project management professionals to develop a clear understanding of how corporate productivity improvement programs are set up, administered, monitored, and integrated within the broader organization. The detailed evaluation of the companies' programs considered potential variances based on organization size and sector. The interviews also addressed barriers to corporate productivity program practices, and the strategies companies used to remove or mitigate them. These findings supported the subsequent phases of the research approach by helping the research team develop an understanding of how mitigations are initiated and executed across organizations, projects, and company interfaces.

The interviews confirmed the appropriateness and effectiveness of the measurable Corporate Productivity Programs Actions. The assessment of these Actions allowed the verification of company's program commitment: well established and mature or inconsistent and mostly "lip service."

Phase 2 Survey

One of the main objectives of the Phase 2 Survey was to confirm and assess program Barriers. Barriers are systemic challenges to productivity. These Barriers may occur at different frequencies within company corporate levels or on company projects. Barriers also have a varying impact on improving productivity. For each potential barrier, the survey evaluated the likelihood of occurrence and its relative impact.

Phase 2 survey also investigated strategies used by companies to mitigate these barriers. Data on level of implementation and degree of effectiveness were collected. This data supported the development of the Corporate Productivity Program Assessment Method. This assessment is a critical step of the Implementation Framework, which is one of the main deliverables of this research.

Case Studies

The main objectives of the case studies was to demonstrate and validate the Corporate Productivity Program Assessment Method. The case studies were conducted with an owner and a contractor company to ensure that varying perspectives were captured and incorporated into process updates. Each case study followed five steps:

1. Educate Participants – webinar
2. Assess Corporate Productivity Program – survey (included in Appendix A)
3. Identify Barriers – evaluation (shown in Appendix B)
4. Discuss Findings – face-to-face interview
5. Feedback on Assessment – face-to-face interview and feedback form

Both companies participated in a 30-minute webinar to understand the Corporate Productivity Program. This presentation outlined the program, its assessment process, and the timing of the case study. Following the webinar, the paired companies were issued a web-based survey that covered the 94 Actions (see Appendix A).

Overall, the case studies are intended to demonstrate the feasibility of performing a Corporate Productivity Program Assessment and to capture suggestions for improvements. The feedback provided insight on how to make the assessment more practical, and its outputs easier to leverage. These findings and feedback items are captured in Chapter 4 under “Assessment Demonstration and Testing.”

Compile Findings

Data collection and analysis led to key findings that accomplished the research objectives. These findings were grouped into the following four areas:

1. Productivity Practice Implementation
2. Corporate Productivity Program Actions (Best Practices)
3. Corporate Productivity Program Barriers
4. Corporate Productivity Program Implementation Framework

Chapter 3
Findings

Productivity Practices Implementation

The research assessed the level of implementation of productivity practices in the industry. It demonstrated that productivity practices are inconsistently used by varying organizations. It also helped to develop an understanding of the level of involvement of the corporate productivity programs in the implementation of productivity practices. This allowed a better understanding of how productivity practice implementation is impacted by the characteristics and maturity of varying corporate programs.

More than 30 productivity practices were referenced and utilized in the research. The proven impact that these practices have on productivity was used to relate higher levels of implementation of corporate productivity program actions with improved productivity performance. The practices span the full spectrum of project management, as construction productivity is impacted by activities conducted in all phases of a project.

Productivity practices are implemented to better plan, monitor, and control project execution aspects that heavily influence construction productivity. Many productivity practices target project, activity or craft discipline productivity improvement and include practices such as constructability, advanced work packaging, activity analysis, and materials management. These practices provide methods for a program to accomplish productivity improvements. The Corporate Productivity Program should help companies improve utilization of project-level practices proven to improve productivity.

A survey conducted in this research resulted in better understanding of the industry utilization of productivity practices identified through the background review. This also clarified the inconsistency of practice implementation. The utilization of these practices is summarized in Table 1.

In addition to assessing practice utilization, the researchers gathered data to assess the causes for inconsistent levels of implementation across company portfolios. The lack of corporate ownership contributes to the challenges of consistent productivity practice use and implementation. Without corporate engagement, projects must identify and implement practices. Table 2 displays the lack of corporate-level responsibility for consistent productivity performance.

Table 1. Productivity Practice Utilization (in order of highest utilization)

Productivity Practice	Percent of Projects Using Practice					
	>75%	51–75%	26–50%	0–25%	Not Utilized	Unknown
Zero Accidents Techniques	83%	9%	0%	4%	2%	2%
Project Controls	57%	19%	21%	2%	0%	0%
Project Organization Planning	51%	9%	23%	11%	2%	4%
Project Risk Assessment	51%	19%	13%	13%	2%	2%
Quality Management	49%	19%	15%	9%	4%	4%
Project Delivery and Contract Strategy	45%	17%	11%	15%	9%	4%
Planning for Startup	43%	23%	13%	15%	6%	0%
Constructability	38%	21%	21%	19%	0%	0%
Human Resource Management	38%	21%	9%	13%	11%	9%
Change Management	36%	23%	13%	23%	2%	2%
Front End Planning	32%	23%	28%	11%	4%	2%
Interface Management	32%	23%	15%	17%	9%	4%
Materials Management	32%	23%	15%	13%	9%	9%
Alignment	23%	19%	23%	21%	4%	9%
Team Building	23%	21%	30%	19%	4%	2%
Benchmarking and Metrics	21%	11%	19%	40%	2%	6%
Planning for Modularization	21%	26%	19%	23%	9%	2%
Productivity Adjustment Factors	21%	21%	15%	19%	13%	11%
Disputes Prevention and Resolution	19%	11%	15%	26%	13%	17%
Lessons Learned	19%	19%	28%	23%	9%	2%
Engineering Management Interface	17%	26%	21%	28%	4%	4%
Equipment and Tool Logistics	17%	19%	15%	19%	21%	9%
Partnering	17%	17%	34%	28%	0%	4%
Advanced Work Packaging (AWP)	15%	6%	11%	47%	11%	11%
Rework Reduction Program	15%	6%	28%	23%	21%	6%
Workforce Development Assessment	15%	21%	11%	26%	17%	11%
Craft Information Systems	13%	20%	15%	28%	20%	4%
Flow Diagrams and Process Charts	11%	13%	13%	30%	23%	11%
Activity Analysis	11%	9%	9%	36%	23%	13%
Foremen/Craft Input	11%	9%	15%	32%	21%	13%
Technology and Innovation Invest.	11%	13%	30%	30%	13%	4%
Lean Construction	9%	13%	21%	32%	13%	13%
Supervisor Financial Incentives	9%	2%	13%	28%	36%	13%
Crew Balance Chart	6%	9%	11%	28%	28%	19%
Implementation of CII Research	6%	6%	26%	34%	11%	17%
Craft Financial Incentives	4%	2%	9%	34%	38%	13%
Best Productivity Practice Implementation Index	2%	6%	9%	34%	36%	13%
Five-Minute Ratings	2%	2%	2%	17%	60%	17%

Table 2. Gap in Corporate-Level Management of Productivity Practices

Productivity Practice	Not a Corporate-level Practice
Best Productivity Practice Implementation Index	74%
Five-Minute Ratings	74%
Financial Incentives for Productivity – Craft	64%
Crew Balance Chart	64%
Financial Incentives for Productivity – Supervisors	58%
Craft Information Systems	52%
Foremen/Craft Input	48%
Activity Analysis	46%
Rework Reduction Program	42%
Implementation of CII Research	40%
Lean Construction	40%
Advanced Work Packaging (AWP)	38%
Disputes Prevention and Resolution	37%
Workforce Development Assessment	36%
Flow Diagrams and Process Charts	33%
Productivity Adjustment Factors	31%
Interface Management	27%
Alignment	25%
Equipment and Tool Logistics	24%
Team Building	23%
Planning for Modularization	21%
Benchmarking and Metrics	21%
Human Resources Management	20%
Materials Management	18%
Quality Management	15%
Engineering Management Interface	14%
Planning for Startup	14%
Partnering	14%
Project Delivery and Contract Strategy Analysis	13%
Technology and Innovation Investigation	12%
Lessons Learned	11%
Constructability	9%
Change Management	9%
Project Organization Planning	7%
Front End Planning	7%
Zero Accidents Techniques	5%
Project Risk Assessment	3%
Project Controls	3%

Corporate Productivity Program Actions (Best Practices)

Corporate productivity programs were characterized based on successful models used for other enterprise-level programs such as safety and lessons learned. That basis gave support for a familiar program structure, like the measurable actions and tenets for success. Elements of the Corporate Productivity Program were established. With input from subject matter experts. Alignment was established on six Elements: Leadership, Resources, Structure and Communications, Planning for Productivity, Productivity Monitoring and Control, and Continuous Improvement.

In identifying the best corporate practices for productivity improvement programs, RT-340 identified more than 100 Actions, based on literature review, interviews with subject matter experts, and research team analyses. Actions are defined as measurable enterprise-level best practices of Corporate Productivity Programs that enable successful program management and the implementation of productivity practices across company project portfolios. These Actions span many aspects of company business, such as the development of goals and objectives to focus company efforts, the performance of project controls processes, and utilizing metrics for continuous improvement.

After the SMEs eliminated redundant Actions, they used the six Elements to group the 94 Actions into program-shaping segments: groups of program Actions that assess similar areas and responsibilities of Corporate Productivity Programs for program management and improvement evaluation. Each Element group provides context for its underlying Actions and the groups divide each program into manageable segments of 11 to 21 Actions.

Leadership

Leadership is a critical facet of established corporate programs. Leaders' primary Actions for Corporate Productivity Programs are directing focus, ensuring accountability, and aligning stakeholders (Ellish, 2008). Similar to safety, leadership of productivity programs establishes goals, objectives, consistency, culture development, and stakeholder alignment (CII, 2003). The research actions center these behaviors on corporate leadership regarding productivity objectives, accountability, and leadership driven communication and commitment (Ellish, 2008).

Leadership Actions

L 1. Promote productivity culture.

L 2. Define productivity metrics.

L 3. Set productivity goals.

L 4. Ensure productivity goals support business objectives.

L 5. Align corporate leadership on productivity goals.

L 6. Circulate productivity plans for buy-in and feedback.

L 7. Take ownership of productivity improvement.

L 8. Display commitment to productivity goals.

L 9. Communicate productivity goals consistently.

L 10. Recognize productivity successes at the corporate level.

L 11. Promote the implementation of productivity practices across the project portfolio.

L 12. Designate corporate champions with leverage to improve practice utilization.

L 13. Provide corporate resources to support project implementation of productivity practices.

L 14. Align project leaders on productivity goals.

L 15. Recognize productivity successes at the project level.

Resources

Resources are necessary to operate and support program goals. Personnel accountability, training, and qualifications are identified as resource factors influencing both program management and project implementation of productivity practices (Tabassi, 2011). Additionally, funding and technology are resources necessary to enable development of system interfaces (NRC, 2009). At the project level, site management knowledgeable and experienced in workforce management practices are critical to success (Thomas, 2009).

Resources Actions

R 1. Promote the implementation of productivity practices.

R 2. Train and develop corporate personnel to properly address productivity.

R 3. Assign qualified personnel for positions that manage productivity practices.

R 4. Allocate time for corporate personnel to perform duties relative to productivity.

R 5. Hold corporate personnel accountable for their roles with productivity goals and practices.

R 6. Require training and development of project personnel on productivity practices.

R 7. Ensure project personnel fully understand and support productivity practices.

R 8. Ensure project teams are capable of defining and measuring productivity.

R 9. Ensure individual capabilities and qualifications are in place for positions that manage productivity practices.

R 10. Demand productivity practices create information that is used in decision making.

R 11. Provide historical data and lessons learned needed for productivity practices.

R 12. Fit or adjust productivity practices based on project size and complexity.

R 13. Provide funding for efforts toward productivity goals.

R 14. Dedicate funds to the analyses of productivity practices during project front end planning.

R 15. Provide technology and tools needed for the implementation or productivity practices.

R 16. Establish interfaces between productivity systems and corporate systems supporting other functions.

Structure and Communications

As identified in lessons learned programs, interfaces and knowledge transfer are critical to a program spanning across a company. The structure focuses on organizational aspects, such as departmental interfaces and program relationship with project teams. Communications addresses the need to connect those organizations across hierarchy, departments, and scope (NRC, 2009). Structure and Communications also address challenges common to construction projects, such as addressing cultural and language differences (Chinowsky and Molenaar, 2006).

Structure and Communications Actions

S 1. Align corporate functions or departments on corporate productivity goals.

S 2. Share productivity reports across functions, disciplines, and groups.

S 3. Create an organizational strategy supporting productivity goals.

S 4. Establish clear interfaces between the corporate departments regarding productivity practice implementation.

S 5. Ensure other corporate programs understand their impact and roles regarding productivity.

S 6. Communicate roles and responsibilities within productivity practices for corporate personnel.

S 7. Provide corporate personnel to support project teams in the implementation of productivity practices.

S 8. Establish interdisciplinary and cross-functional collaboration to enable achievement of productivity goals.

S 9. Hold corporate personnel accountable for their productivity practice responsibilities.

S 10. Establish a company hiring process that supports productivity goals.

S 11. Expect alignment of project groups or teams on project productivity goals.

S 12. Promote collaboration of personnel from various backgrounds through productivity interfaces.

S 13. Consider cultural backgrounds when leveraging productivity practices.

S 14. Manage language barriers to productivity practices implementation.

Planning for Productivity

Productivity practices and behaviors are often established before construction commences. These plans mitigate productivity challenges, such as design conflicts and poor materials management. Program planning needs to be documented and readily available to project teams attempting to implement practices. Also, parties need to align to promote successful execution of plans from implementation guidance, control systems, and feedback cycles (Goodrum, 2013).

Planning for Productivity Actions

P 1. Document key processes and procedures for productivity practices.
P 2. Make productivity practices readily available to project personnel.
P 3. Provide implementation guidance when developing productivity practices for projects.
P 4. Require alignment meetings between groups and interfacing companies for productivity practices.
P 5. Establish company-wide procurement and materials management practices and expectations.
P 6. Ensure that project operating or owner organizations are engaged throughout projects.
P 7. Ensure safety professionals' input is leveraged to improve productivity practice implementation.
P 8. Require risk assessments prior to project execution and implementation of productivity practices.
P 9. Leverage project delivery methods and contracting strategies that pursue productivity goals and business objectives.
P 10. Demand that change management procedures be consistently utilized on projects.
P 11. Improve systems that manage construction and engineering interfaces.
P 12. Ensure front end planning, engineering, and procurement activities consider productivity goals.
P 13. Package work for construction, engineering, and installation to enable productive construction.
P 14. Implement project controls systems and roles consistently.
P 15. Demand projects plan early for construction, commissioning, and start-up relationships.
P 16. Confirm that project evaluate schedules considering productivity impacts.
P 17. Establish pre-fabrication, modularization, and off-site fabrication evaluations to capture productivity benefits for projects.
P 18. Require that projects plan site layouts to increase craft time on tools and productivity.
P 19. Support project materials management functions on projects.
P 20. Establish quality management systems and practices on projects.
P 21. Adjust expectations of productivity practice utilization based on project size and complexity.

Productivity Monitoring and Control

Productivity measurement, consistent tracking and reporting, and feedback cycles are integral to all other Elements. This operational segment of the program addresses a company's ability to identify and mitigate challenges related to construction productivity. It addresses short-term project needs, such as performance targets, project controls, and problem solving using productivity data (Goodrum, 2013). Additional key aspects of this Element include the long-term organizational need for benchmarks and data to support continuous improvement (Nasir, 2012).

Productivity Monitoring and Control Actions

MC 1. Implement practices to check productivity performance on projects.

MC 2. Establish key productivity performance indicators for projects.

MC 3. Track key productivity performance indicators throughout the project life.

MC 4. Align quality management with productivity goals.

MC 5. Track projects utilization of productivity practices to verify practice performance.

MC 6. Ensure projects evaluate direct work or unit rates to know how and where productivity is lost.

MC 7. Provide support for project evaluation of craft time on tools and work-hours.

MC 8. Expect projects to evaluate equipment utilization to validate equipment needs.

MC 9. Collect productivity performance metrics data from projects.

MC 10. Provide benchmarking data to monitor performance based on project location and scope norms.

MC 11. Ensure project decision makers are aware of productivity impacts.

MC 12. Ensure project decision makers are aware of subsequent safety, quality, cost, and schedule impacts.

MC 13. Require that project teams to leverage productivity information when making decisions for impacts and options.

MC 14. Expect projects to make craft productivity, planning, and execution information readily available and visible so craft teams know how they are performing.

MC 15. Ensure projects evaluate equipment utilization and needs during project execution.

MC 16. Provide resources to reduce and manage rework on projects.

MC 17. Ensure project recovery plans consider productivity impacts on business outcomes.

Continuous Improvement

Formalized programs enable ongoing improvement in processes and efficiency. Actions about capture and communication of productivity lessons learned are measured here, and the systems to act upon learnings are assessed. Additionally, this Element checks a company's methods to identify new productivity practices, such as piloting practices prior to large-scale implementation. Lessons learned practices are leveraged from CII Research Summary 230-1, *Effective Management Practices and Technologies for Lessons Learned Programs* (CII, 2005).

Continuous Improvement Actions

CI 1. Track and improve productivity through a continuous improvement program.

CI 2. Encourage development or use of new or innovative productivity practices.

CI 3. Support technology investigation and innovation.

CI 4. Analyze the risk-reward impacts of using productivity practices for company, projects, and individuals.

CI 5. Use pilot projects to test new or innovative approaches to productivity improvement.

CI 6. Collect and analyze productivity metrics for future planning and improvement.

CI 7. Establish a feedback cycle for productivity practices performance.

CI 8. Use productivity practice performance data to improve their utilization.

CI 9. Capture, analyze, and disseminate lessons learned related to productivity.

CI10. Disseminate productivity practice successes to project teams.

CI11. Highlight and distribute productivity performance data throughout company and with business partners.

Due to the lack of a reliable variable for evaluating company-wide productivity performance, the researchers indirectly tested a program's capacity to influence productivity by assessing how measurable actions correlated to the utilization of proven productivity practices. While indirect, this method leveraged previous research on productivity systems and practices that have been proven to improve productivity performance (Goodrum, 2013; Shan, 2016; Thomas, 2009). Additionally, these groupings of programs demonstrated the ability to differentiate between company programs based on the research measurement of scores.

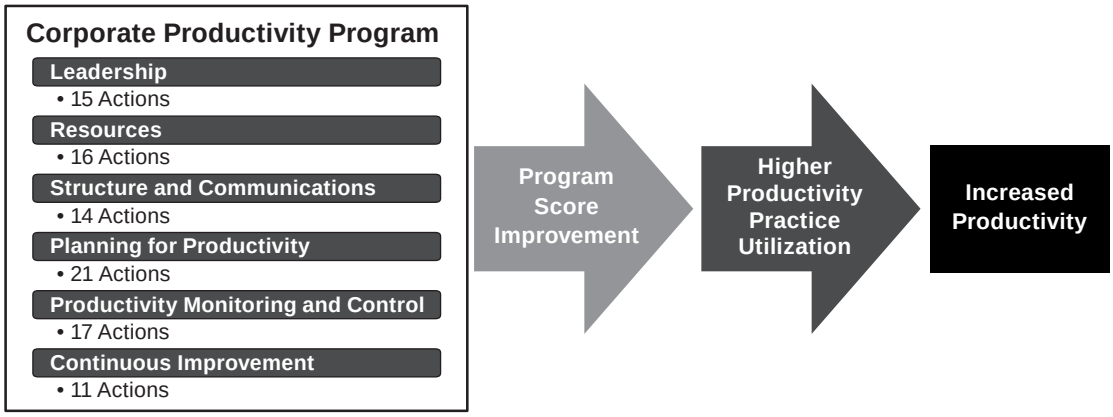

Figure 3. Corporate Productivity Program Purpose

Improving the level of implementation of the proposed 94 Action demonstrated correlation with increased utilization of proven productivity practices. This was a critical step toward validating the corporate program approach and Actions developed. Productivity improvement is expected to result from increased utilization and improved implementation of these proven practices. Thus, correlation with increased use indicates the program supports the primary long-term objective of the research.

Correlation was tested by comparing the practice utilization of Groups 1 and 2. By comparing these two groups using Kruskal-Wallis statistical testing, the data demonstrated a correlation between a higher Program Score and the higher utilization of specific productivity practices. Table 3 displays the specific productivity practices' correlations.

Zero Accidents Techniques were used with high consistency across organizations with both low and high Program Scores. This high utilization is desirable, but it caused the practice not to demonstrate any correlation with Program Score groupings or other analyzes. Alternately, Advanced Work Packaging is an emerging practice that was not utilized by many participants, and its low sample count did provide strong correlation.

Table 3. Correlation of Program Scores and Productivity Practice Utilization

Productivity Practice	Z	Significance
Disputes Prevention and Resolution	–4.029	0.000*
Productivity Adjustment Factors	–3.784	0.000*
Crew Balance Chart	–3.413	0.001*
Workforce Development Assessment	–3.386	0.001*
Materials Management	–3.250	0.001*
Equipment and Tool Logistics	–3.206	0.001*
Implementation of CII Research	–3.143	0.002*
Project Risk Assessment	–3.118	0.002*
Rework Reduction Program	–3.099	0.002*
Craft Information Systems	–2.966	0.003*
Project Delivery and Contract Strategy	–2.822	0.005*
Project Organization Planning	–2.764	0.006*
Flow Diagrams and Process Charts	–2.624	0.009*
Activity Analysis	–2.607	0.009*
Project Controls	–2.598	0.009*
Technology and Innovation Investigation	–2.568	0.010*
Engineering Management Interface	–2.553	0.011*
Lean Construction	–2.513	0.012*
Human Resource Management	–2.491	0.013*
Best Productivity Practice Implementation Index (BPPII)	–2.462	0.014*
Foremen/Craft Input	–2.239	0.025*
Change Management	–2.231	0.026*
Team Building	–2.045	0.041*
Front End Planning	–2.011	0.044*
Lessons Learned	–1.830	0.067*
Financial Incentives for Prod. – Supervisors	–1.822	0.068*
Five-Minute Ratings	–1.736	0.083*
Planning for Startup	–1.731	0.083*
Constructability	–1.680	0.093*
Planning for Modularization	–1.661	0.097*
Financial Incentives for Productivity – Craft	*–1.467*	*0.142*
Benchmarking and Metrics	*–1.366*	*0.172*
Partnering	*–1.259*	*0.208*
Interface Management	*–1.067*	*0.286*
Quality Management	*–1.031*	*0.303*
Advanced Work Packaging (AWP)	*–0.997*	*0.319*
Alignment	*–0.432*	*0.666*
Zero Accidents Techniques	*–0.097*	*0.923*

** Practices listed in black had a 90% significance-level or higher (two-tailed)*

Corporate Productivity Program Barriers

The identification of Program Barriers can help a company understand which issues may create enterprise-level clashes and challenges for the effective implementation of productivity programs. Due to the broad span of productivity impacts and program characterization, Barriers are expected to exist across organization groups and departments, as well as vertically in company hierarchies. This research identified key and common themes.

The team compiled 60 Program Barriers that span the Corporate Productivity Program Elements. The Barriers address issues regarding horizontal and vertical interfaces within organizational structures, productivity management gaps, and personnel and industry challenges.

Program Barriers

B1. Energy to move productivity practices forward from project to project fades over time, losing support and emphasis.

B2. Changing individual and departmental practices takes more time than the organization allows for improvement.

B3. Lessons Learned are ignored or under-utilized.

B4. Continuous improvement takes the company long periods with lacking celebration of interim accomplishments.

B5. Organizational silos prevent productivity practice improvements because knowledge is not transferred.

B6. Company fails to capture and resolve root causes of low productivity.

B7. Corporate management struggles with staying aware of project status, challenges, and needs.

B8. Corporate goals for productivity improvement become stale or overbearing as each year is, “improve on last year.”

B9. Leadership changes directions too often on productivity related resources and objectives.

B10. Goals developed at the department level without overarching corporate objectives as guidance.

B11. Corporate managers unfamiliar with how to execute project scope fail to appropriately assist execution.

B12. Productivity is not a focus of corporate leadership.

B13. Corporate productivity framework makes projects feel micromanaged and hassled.

B14. Company does not innovate construction practices without push from outside entities (owner, contractor, government).

B15. Business units have different drivers and measures of success that create misalignment within the company.

Corporate Productivity Program Barriers *(continued)*

B16. Project schedules lead to being behind and rushing project phases, over staffing, and other adjustments that hinder productivity.

B17. Change management is handled inconsistently within the company and creates confusion and rework.

B18. Personnel on many company projects are inefficient because of extended work periods.

B19. Company takes on contracts without incorporating terms that support productive execution.

B20. Lack of consistent corporate work practices make transitions between groups and projects more difficult.

B21. Contracting in varying locations creates challenges of contractor availability, experience, local work requirements, and familiarity.

B22. Corporation is inefficient with integrating construction, engineering and installation work packages.

B23. Company tends to have optimistic plans that fail to prepare and plan for improving productivity.

B24. Company project teams are not convinced the benefits of implementing practices are worth the cost and effort.

B25. Specific productivity practices are implemented inconsistently by each project team.

B26. Construction scope boundaries are often mismanaged on company projects.

B27. Low productivity worksites challenges and mitigations are not captured or transferred between projects.

B28. Unable to consistently recreate high productivity performance on worksites.

B29. On many projects, company contracts lead to confusion or unclear deliverables.

B30. At the corporate level, craft are blamed for poor productivity without addressing other gaps to improve future projects.

B31. Craft feedback is not used to capture productivity improvement opportunities on most company sites.

B32. Different companies, execution types, and groups measure productivity in different ways – creating varying metrics.

B33. In most worksites, craft lose too much time for travel, breaks, getting tools and materials, or other non-productive work.

B34. Historical productivity impact of practices and methods often lack direct results that could engage more users.

B35. Monitoring and reporting cycles run extended periods that create slow monitoring cycles.

B36. Most company construction teams are unsure what caused high or low performance on specific jobs.

B37. Improved productivity is not visible to most personnel on construction sites.

B38. Rapid productivity improvement is difficult because monitoring, analyzing, solving, and implementing solutions is all parallel with continuing execution.

***Corporate Productivity Program Barriers** (continued)*

B39. Monitoring cycles to improve productivity require lots of manpower and attention.

B40. Company does not actively share productivity information with others.

B41. Various craft disciplines make improvements difficult to manage due to split focus.

B42. In most projects, poor cost estimates and funding result in management and contract behaviors that harm productivity.

B43. Stockholders and funding sources create distraction and goals that are inconsistent with productivity performance.

B44. High costs of construction technology and training prevent adoption of new technology by the organization.

B45. Staffing projects appropriately is difficult due to limited experienced construction personnel.

B46. Remote work frequently causes company personnel to lose sight of execution and productivity risks.

B47. Project scales make productivity impacts too complex to consistently hold individuals accountable.

B48. Performance in organizations is not well tied to recognition, especially at productivity scope levels.

B49. Project personnel are overwhelmed with daily work, limiting identification and management of productivity impacts.

B50. Qualified craft labor is not readily available for many company work sites.

B51. Qualified foremen/supervisors/project managers are not readily available on many company work sites.

B52. Programs and systems cannot be accessed by people who need the information.

B53. Inefficiency and waste due to poor interfacing of project management technology and systems.

B54. Company has not updated organization and communications to match growth or market changes.

B55. Consensus, approvals, and organizational hierarchy cause frustration and wasted efforts.

B56. Corporate support functions have low influence on project utilization of productivity practices.

B57. Projects frequently struggle to form relationships with craft labor interfaces.

B58. Government regulations changing create issues for corporate planning. (e.g., frequently delaying projects, compressing construction schedules)

B59. Lack of trust with industry partners results in extra indirect personnel, increased reviews, and resistance to company productivity practices.

B60. On many company projects, inexperienced project firms inhibit productivity performance.

Chapter 4

Implementation Framework

The Implementation Framework of the Corporate Productivity Program is designed to enable a company to identify program strengths and weaknesses (see Figure 4.). These strengths and weaknesses consist of evaluated Actions that represent program-level best practices. In addition, likely barriers to program success are identified through relationships with weak Actions.

Figure 4. Implementation Framework Process and Cycle

Step 1. Executive Commitment and Engagement

Executive commitment is critical to program implementation and success. To have program implementation that improves performance, the program requires an executive sponsor committed to success. However, without commitment and engagement from executive leadership, a program is unlikely to shift company behaviors or performance.

As has been shown with safety programs, executive leadership, commitment, and engagement can improve company-wide performance and even drive industry-level improvement. This system will highlight where to place that energy and focus to improve corporate-level practices.

Step 2. Develop Strategy

Corporate Productivity Program implementation should be planned to target the data needed to accurately identify program strengths and weaknesses. Based on company structure and focus, varying breadth of corporate leadership and depth of reach to project-level positions should be targeted. By reaching a mix of corporate leadership and project practitioners, these strategies can offer the company a variety of insights.

Broad Executive Audience (horizontal assessment):

- Company-wide perspective and status
- Identify leading and lagging business units
- Program objectives and expectations
- Executive leadership alignment
- Identification of organizational inconsistencies
- Identification of silo best practices
- Ability to generate competition between organizations

Depth into Project Practitioners (vertical assessment):

- Program penetration with productivity objectives
- Data to perform root cause analysis
- Consistency of messages and practice
- Project, group, and execution silos
- Use of project management practices
- Generates company-specific pilot case to demonstrate and replicate

Prior to assessing the program, participants should be educated on the Corporate Productivity Program concept and system. The company should introduce foreseen benefits, commitment to incorporate a program, and a discussion of the following the recommended topics:

1. Corporate Productivity Program
    a. Definitions
    b. Program Structure
        i. Elements
        ii. Actions

2. Improvement Approach
    a. Strong Actions
    b. Weak Actions
    c. Barriers
    d. Misalignment
3. Assessment Process
    a. Overview
    b. Data Collection
    c. Output Development
    d. Reports and Feedback Cycle
4. Implementation Plan
5. Time for Questions

Step 3. Assess Six Key Elements

Data collection is a critical step in the assessment process. In this process, the program's six key Elements are evaluated to identify program strengths and weaknesses. This diagnosis is designed to enable the company to use assessment data in identifying areas and specific actions to direct energy toward company-wide improvement.

A survey with established deadline should be sent to the corporate leaders and project practitioners. This survey is an evaluation of the 94 Actions on a maturity model scale. A paper survey version is provided in Appendix A.

Action Maturity Model Scoring

1. Initial – Action is not performed OR rarely performed
2. Inconsistent – Action is performed inconsistently
3. Defined – Action is understood but inconsistently performed
4. Mature – Action is understood and consistently performed
5. Optimal – Action is understood, consistently performed, and has been optimized over time

To understand different evaluations of Actions and to analyze varying sources of misalignment, some individual information collection is suggested:

1. Company or Business Unit
2. Department
    a. Current Role
    b. Project (if applicable)
    c. Organizational Role
    d. Years of Experience
    e. Participation in Pre-Survey Preparation
    f. Contact Information

Score Calculations

Score calculations are averages of responses. Thus, an Action Score is the average of all responses to the specific Action. After calculating the averages of all Actions, the Element Score is the average Action Score within the Element set of Actions. Finally, Program Score is the average of the six Element Scores.

Strong Actions

Strong Actions are those scoring 3.5 or higher. However, companies may set different hurdle expectations based on program-specific maturity and findings.

Weak Actions

Weak Actions are those scoring 2.5 or lower; however, companies may set different hurdle expectations based on program-specific maturity and findings. Weak Actions should be addressed for improvement. The method to identify possible Barriers to successful Actions is explained in Step 5.

Misalignment

Misalignment of perspectives on program Actions is another important metric. Misalignment identifies potential improvement areas of the Corporate Productivity Program consistency and awareness. Through discussion of different perspectives, participants can address organizational silos, best practices, and program deficiencies.

Here misalignment is represented by a count of outliers. Outliers are responses that are more than a full maturity level away from the median response. This value helps by identifying which Actions have misaligned perspectives, which should be discussed by participants to understand the inconsistency.

In all Corporate Productivity Program calculations, the maturity level is quantified linearly:

- Initial = 1
- Inconsistent = 2
- Defined = 3
- Mature = 4
- Optimal = 5

For misalignment, these values can be viewed as a number line. The median value is used to identify the middle response, and a range of ±1 from this middle response is considered aligned. The responses that are not in the ±1 range are misaligned. For example, if the median is “Defined” (3), then perspectives of “Initial” (1) or “Optimal” (5) fall outside the range of ±1 level of maturity. These outliers are counted to generate a misalignment value. An example of this methodology is outlined in Figure 5. For evaluations of many responses to the 94 Actions, RT-340 recommends using Excel or similar software.

Example of a Misalignment Calculation

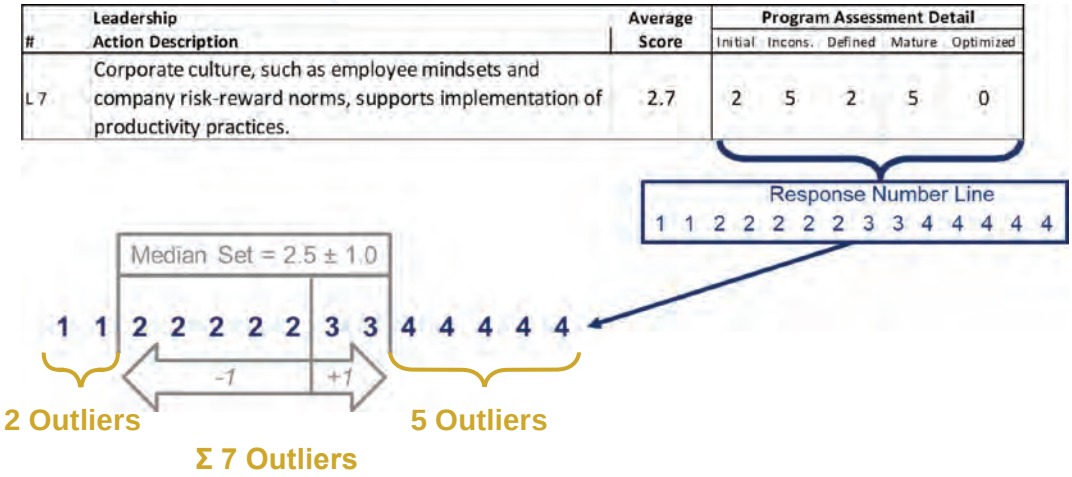

Figure 5. Misalignment Outlier Calculation

Step 4. Identify Barriers

The identification of potential Barriers will help a team developing improvement plans. Mitigating program-level Barriers can enable the success of multiple Actions. The recommended approach is to identify Barriers for weaker Actions, then discuss and lay out a plan for short- and long-term mitigations.

An Action's potential Barriers are found in Appendix B:

- In the leftmost column, Barriers 1 through 60 are listed in the same order they are presented in the report (e.g., "B6" is Barrier #6: Company fails to capture and resolve root causes of low productivity).
- Across the top, each Element offers its Actions (e.g., "L 1" is Leadership Action #1: Promote productivity culture). Locating to an Element that is indicated as weak and looking down an Action column will indicate both which Barriers apply to that Action and the significance of the relationship (1 is low, 2 is medium, and 3 is high). These relationships are also color-coded to emphasize their relative intensity.

Example of Barrier Identification

If Leadership Action #1 is a program's weak Action, then the team needs to identify which Barriers could possibly prevent success in promoting productivity culture:

1. Go to Appendix B.
2. Look at the L 1 column that represents Leadership Action #1.
3. Identify the related Barriers and the significance of each relationship.

Barriers 1, 2, 6, 16, 17, and others relate to Leadership Action #1, so each of these relationships is represented. Barriers 6 and 16 show a "3" on a red background to indicate that they are among the Barriers most likely to impede Leadership Action #1.

While some Barriers may be low-hanging fruit to mitigate and improve program success, many efforts will address systemic changes and long-term objectives. During Step 7, the implementation team will use the discussion of potential Barriers to identify program-specific issues. Then, during Step 8, the team will establish a plan for implementing mitigations.

Leadership	L 1	L 2	L 3
B1	2		2
B2	2		1
B3		2	3
B4		2	2
B5			
B6	3		3
B7			
B8			
B9			1
B10		1	
B11			1
B12			
B13			
B14			
B15			
B16	3	2	
B17	2		

Figure 6. Detail of Table Showing Action–Barrier Relationships

Step 5. Evaluate and Discuss Findings

The Construction Productivity Program Assessment Report will allow the company to document findings for review and discussion. Additionally, the documented report will enable tracking of program performance over time. Appendix C provides the outline of a recommended report and example figures.

Assessment Report Outline

1. Implementation Review
2. Program Score Overview
3. Element Score Reviews – highlighting strong and weak Actions
    a. Leadership
    b. Resources
    c. Structure and Communications
    d. Planning for Productivity
    e. Productivity Monitoring and Control
    f. Continuous Improvement
4. Potential Program Barriers
5. Misalignment Issues
6. Implementation Planning/Recommendations

Discussion is a key point in the Implementation Framework. This is the opportunity to bring leadership together to understand program status and areas for improvement. The initial Implementation Plan focus areas are identified. Additionally, misalignment can be directly addressed to understand causes and possible mitigations.

Outline of the discussion should be structured in accordance with the Assessment Report. This will allow data to support discussion and questions. It will also provide a framework for addressing the company's status and path forward.

Step 6. Develop Implementation Plan

- Capture program improvement discussion points
- Assign improvements to champions or groups
  - Identify root causes of deficiencies
  - Develop improvement implementation plans
  - Cycle for feedback and adjustment
- Conduct program assessments roughly annually to diagnose weak Actions
- Celebrate accomplishments!

Implementation Framework Demonstration and Testing

Two case studies were conducted to demonstrate the Implementation Framework. These followed and were used to update the process described in the previous section's Implementation Framework and assessment processes. Rather than running an implementation plan, the case studies stopped after evaluation and discussion of findings to gather feedback on the assessment process, report, and possible impacts of implementing a Corporate Productivity Program.

The owner company had 14 responses to the survey, and the contractor organization had 8 responses. These responses were summarized for each company into a report, an example of the reports is Appendix C. These reports were leveraged as detailed back-up during the face-to-face discussions. The research focus of the case studies was demonstration and testing of the assessment process; thus, the company-specific results remained confidential. Instead, we focus on feedback and improvement opportunities provided by case study participants.

Company perspectives on strategic use of the assessment is an initial key finding. The case studies opened the discussion on horizontal and vertical scopes, which are now outlined in Step 2 of the process. Participants also indicated implementation strategies will be company-specific and provided examples, which expanded the research understanding of tactics that will vary by company and program objectives.

In addition to strategy, feedback focused data collection and assessment outputs. The survey was considered moderately easy to understand and use. Participants also indicated the survey is reasonable in length as a data collection process. To improve data collection, companies may customize the survey to company terminology or audience. This can improve survey participants' understanding of concepts and provide direct data.

In both data collection and assessment outputs, the level of anonymity is also expected to balance. As indicated in the process, companies will need the ability to identify groups or organization levels that are struggling. Thus, the survey data are unlikely to be completely anonymous. However, a balance with privacy is needed to ensure the integrity of data collection.

In other outputs, the information on Elements and Actions was typically considered understandable and informative, and the report quality is good. However, feedback indicated that understanding of order and criticality of Action improvement would be a desirable update. This would prioritize, or sequence Actions based on research, rather than the implementation plan being dependent on discussion and company-specific evaluation. In addition to prioritizing the Actions, it was also recommended that CII practices be linked, where applicable. Linking to documented practices would provide companies with guidance on means and methods to enhance performance.

Feedback from the case studies indicated that the assessment and discussion were beneficial as diagnostic tools for directing corporate-level effort, and participants would recommend or strongly recommend the Corporate Productivity Program Implementation Framework to improve corporate-level impact on productivity performance.

Chapter 5
Conclusions and Recommendations

Conclusions

The study created a framework for characterizing, assessing, and improving an enterprise-level productivity improvement program. Additionally, the research demonstrated that the Actions (i.e., corporate best practices) identified in the research, when implemented effectively by the program, have a positive relationship with the utilization of practices that are proven to improve productivity performance.

The implementation framework for corporate productivity program characterization and assessment was developed based on six program Elements: Leadership, Resources, Structure and Communications, Planning for Productivity, Productivity Monitoring and Control, Continuous Improvement. These Elements include Actions needed for an enterprise-level program to succeed. In refining the program characterization, 94 Actions were identified as key to program success. These Actions provide measurable components of the corporate productivity program. The assessment method and report was developed based on these Elements and Actions.

After collecting data from more than 30 organizations, the researchers validated that higher Program Scores evaluated through Corporate Productivity Program Assessments were correlated with higher utilization of proven productivity practices. This correlation demonstrates the program's ability to impact productivity. Research also verified that programs have differing strengths and weaknesses.

Barriers to program implementation and success were identified. They were refined and consolidated into a list of 60 Program Barriers that represent the common challenges experienced by the companies investigated.

The long-term purpose of corporate productivity programs research is to improve project portfolio predictability and outcomes through more consistent management of productivity efforts. This has been demonstrated to work within corporate-leadership driven safety. This research is in support of the long-term hypothesis that implementing and improving enterprise-level productivity program management will yield better productivity practice use, and better project and business outcomes can result. However, the efforts to accomplish portfolio improvement through corporate programs in other areas has been demonstrated to need leadership engagement and long-term, formal approach to systematic improvement.

Recommendations

Companies seeking enterprise-level improvement of construction productivity program can benefit from the RT-340 findings by following the Implementation Framework. First, the identification of what productivity is to the company. So, the company-specific benefits and systems for tracking productivity performance must be understood. Then, benefits need to be quantified in terms used by the company, such as cost and schedule impacts. This is a critical step toward engaging leadership at the corporate-level, who are often focused on performance influencing safety, project predictability, cost, schedule, or quality.

After identifying the role of productivity in improving business performance metrics that garner executive leadership attention and support, the company needs to efficiently direct that leadership engagement. Thus, the company-specific Corporate Productivity Program should be conceptualized and outlined using organizational hierarchies and responsibilities. Industry members of RT-340 indicated the program framework was more complex and distributed than anticipated when reviewed, and the ability to direct support will require understanding of the company's program entities and interested parties.

Finally, the focus needs to take support and create an improvement plan. Thus, the program needs to be understood and assessed in a fashion that enables assessment of strengths and weaknesses. Strengths should be identified and replicated across the organization, where possible, and weaknesses may merit mitigation or detailed evaluation. Essentially, the Corporate Productivity Program Implementation Plan is recommended to drive leadership engagement toward an improvement plan.

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Appendix A:
Program Assessment Survey

Participant Information:

a. Company: _____

b. Department (if applicable): _____

c. Your Position: _____

d. Current Project (if applicable): _____

e. Organizational Role: _____

f. Years of Experience: _____

g. Were you able to participate in pre-survey overview? Y N

h. Contact Information – if sending interview request, how to contact

i. Phone: _____

ii. E-Mail: _____

Corporate Productivity Program Element Assessment:

With focus on corporate level, this section assesses elements that form a company's productivity program. This program establishes and maintains company productivity practices and assessment systems to support project productivity practices, toolkits and practice implementation.

Please assess the Corporate Productivity Program by the Actions below using the outlined maturity rating system.

Action Maturity Model Scoring

1. Initial — Action is not performed OR rarely performed
2. Inconsistent — Action is performed inconsistently
3. Defined — Action is understood but inconsistently performed
4. Mature — Action is understood and consistently perform
5. Optimal — Action is understood, consistently performed, and has been optimized over time

LEADERSHIP		Initial		--->		Optimal
1	Promote productivity culture.	1	2	3	4	5
2	Define productivity metrics.	1	2	3	4	5
3	Set productivity goals.	1	2	3	4	5
4	Ensure productivity goals support business objectives.	1	2	3	4	5
5	Align corporate leadership on productivity goals.	1	2	3	4	5
6	Circulate productivity plans for buy-in and feedback.	1	2	3	4	5
7	Take ownership of productivity improvement.	1	2	3	4	5
8	Display commitment to productivity goals.	1	2	3	4	5
9	Communicate productivity goals consistently.	1	2	3	4	5
10	Recognize productivity successes at the corporate level.	1	2	3	4	5
11	Promote the implementation of productivity practices across the project portfolio.	1	2	3	4	5
12	Designate corporate champions with leverage to improve practice utilization.	1	2	3	4	5
13	Provide corporate resources to support project implementation of productivity practices.	1	2	3	4	5
14	Align project leaders on productivity goals.	1	2	3	4	5
15	Recognize productivity successes at the project level.	1	2	3	4	5

RESOURCES		Initial				Optimal
1	Promote the implementation of productivity practices.	1	2	3	4	5
2	Train and develop corporate personnel to properly address productivity.	1	2	3	4	5
3	Assign qualified personnel for positions that manage productivity practices.	1	2	3	4	5
4	Allocate time for corporate personnel to perform duties relative to productivity.	1	2	3	4	5
5	Hold corporate personnel accountable for their roles with productivity goals and practices.	1	2	3	4	5
6	Require training and development of project personnel on productivity practices.	1	2	3	4	5
7	Ensure project personnel fully understand and support productivity practices.	1	2	3	4	5
8	Ensure project teams are capable of defining and measuring productivity.	1	2	3	4	5
9	Ensure individual capabilities and qualifications are in place for positions that manage productivity practices.	1	2	3	4	5
10	Demand productivity practices create information that is used in decision making.	1	2	3	4	5
11	Provide historical data and lessons learned needed for productivity practices.	1	2	3	4	5
12	Fit or adjust productivity practices based on project size and complexity.	1	2	3	4	5
13	Provide funding for efforts toward productivity goals.	1	2	3	4	5
14	Dedicate funds to the analyses of productivity practices during project front end planning.	1	2	3	4	5
15	Provide technology and tools needed for the implementation or productivity practices.	1	2	3	4	5
16	Establish interfaces between productivity systems and corporate systems supporting other functions.	1	2	3	4	5

STRUCTURE AND COMMUNICATIONS		Initial				Optimal
1	Align corporate functions or departments on corporate productivity goals.	1	2	3	4	5
2	Share productivity reports across functions, disciplines, and groups.	1	2	3	4	5
3	Create an organizational strategy supporting productivity goals.	1	2	3	4	5
4	Establish clear interfaces between the corporate departments regarding productivity practice implementation.	1	2	3	4	5
5	Ensure other corporate programs understand their impact and roles regarding productivity.	1	2	3	4	5
6	Communicate roles and responsibilities within productivity practices for corporate personnel.	1	2	3	4	5
7	Provide corporate personnel to support project teams in the implementation of productivity practices.	1	2	3	4	5
8	Establish interdisciplinary and cross-functional collaboration to enable achievement of productivity goals.	1	2	3	4	5
9	Hold corporate personnel accountable for their productivity practice responsibilities.	1	2	3	4	5
10	Establish a company hiring process that supports productivity goals.	1	2	3	4	5
11	Expect alignment of project groups or teams on project productivity goals.	1	2	3	4	5
12	Promote collaboration of personnel from various backgrounds through productivity interfaces.	1	2	3	4	5
13	Consider cultural backgrounds when leveraging productivity practices.	1	2	3	4	5
14	Manage language barriers to productivity practices implementation.	1	2	3	4	5

PLANNING FOR PRODUCTIVITY		Initial		--->		Optimal
1	Document key processes and procedures for productivity practices.	1	2	3	4	5
2	Make productivity practices readily available to project personnel.	1	2	3	4	5
3	Guide project implementation of productivity practices.	1	2	3	4	5
4	Require alignment meetings between groups and companies that interface with project productivity practices.	1	2	3	4	5
5	Establish company-wide procurement and materials management practices and expectations.	1	2	3	4	5
6	Ensure that project operating or owner organizations are engaged throughout project life-cycle.	1	2	3	4	5
7	Ensure safety professionals' input is leveraged to improve productivity practice implementation.	1	2	3	4	5
8	Require risk assessments prior to project execution and implementation of productivity practices.	1	2	3	4	5
9	Leverage project delivery methods and contracting strategies that pursue productivity goals and business objectives.	1	2	3	4	5
10	Demand that change management procedures be consistently utilized on projects.	1	2	3	4	5
11	Establish systems to improve the interface between construction and engineering.	1	2	3	4	5
12	Ensure front end planning, engineering, and procurement activities consider productivity goals.	1	2	3	4	5
13	Expect projects to package project construction, engineering, and installation work documents to enable productive construction.	1	2	3	4	5
14	Implement project controls systems and roles consistently.	1	2	3	4	5
15	Demand projects plan early for construction, commissioning, and start-up relationships.	1	2	3	4	5
16	Confirm that project evaluate schedules considering productivity impacts.	1	2	3	4	5
17	Establish pre-fabrication, modularization, and off-site fabrication evaluations to capture productivity benefits for projects.	1	2	3	4	5
18	Demand that projects plan site layouts to increase craft time on tools and productivity.	1	2	3	4	5
19	Support project materials management functions on projects.	1	2	3	4	5
20	Establish quality management systems and practices on projects.	1	2	3	4	5
21	Adjust expectations of productivity practice utilization based on project size and complexity.	1	2	3	4	5

PRODUCTIVITY MONITORING AND CONTROL		Initial				Optimal
1	Implement practices to check productivity performance on projects.	1	2	3	4	5
2	Establish key productivity performance indicators for projects.	1	2	3	4	5
3	Track key productivity performance indicators throughout the project life.	1	2	3	4	5
4	Align quality management with productivity goals.	1	2	3	4	5
5	Track projects utilization of productivity practices to verify practice performance.	1	2	3	4	5
6	Ensure projects evaluate direct work or unit rates to know how and where productivity is lost.	1	2	3	4	5
7	Provide support for project evaluation of craft time on tools and work-hours.	1	2	3	4	5
8	Expect projects to evaluate equipment utilization to validate equipment needs.	1	2	3	4	5
9	Collect productivity performance metrics data from projects.	1	2	3	4	5
10	Provide benchmarking data to monitor performance based on project location and scope norms.	1	2	3	4	5
11	Ensure project decision makers are aware of productivity impacts.	1	2	3	4	5
12	Ensure project decision makers are aware of subsequent safety, quality, cost, and schedule impacts.	1	2	3	4	5
13	Require that project teams to leverage productivity information when making decisions for impacts and options.	1	2	3	4	5
14	Expect projects to make craft productivity, planning, and execution information readily available and visible so craft teams know how they are performing.	1	2	3	4	5
15	Ensure projects evaluate equipment utilization and needs during project execution.	1	2	3	4	5
16	Provide resources to reduce and manage rework on projects.	1	2	3	4	5
17	Ensure project recovery plans consider productivity impacts on business outcomes.	1	2	3	4	5

CONTINUOUS IMPROVEMENT		Initial				Optimal
1	Track and improve productivity through a continuous improvement program.	1	2	3	4	5
2	Encourage development or use of new or innovative productivity practices.	1	2	3	4	5
3	Support technology investigation and innovation.	1	2	3	4	5
4	Analyze the risk-reward impacts of using productivity practices for company, projects, and individuals.	1	2	3	4	5
5	Use pilot projects to test new or innovative approaches to productivity improvement.	1	2	3	4	5
6	Collect and analyze productivity metrics for future planning and improvement.	1	2	3	4	5
7	Establish a feedback cycle for productivity practices performance.	1	2	3	4	5
8	Utilize productivity practice performance data to improve their utilization.	1	2	3	4	5
9	Capture, analyze, and disseminate lessons learned related to productivity.	1	2	3	4	5
10	Disseminate productivity practice successes to project teams.	1	2	3	4	5
11	Highlight and distribute productivity performance data throughout company and with business partners.	1	2	3	4	5

Appendix B:
Action–Barrier Relationship Mapping

In the tables below, Actions likely program-level barriers are identified. To use these tables, a program should identify which weak Actions the company plans to improve. Each Action is found on the top row of each table. Then, go down the column, capturing each related barrier and its level of relationship to that Action. Each Action's barriers are identified in three tiers:

– High	3	Red
– Medium	2	Orange
– Low	1	Yellow

Leadership	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8	L 9	L 10	L 11	L 12	L 13	L 14	L 15
B1	2		2	2	2	1		1		3					2
B2	2		1		3	3				3	2				2
B3		2	3	3	2	1	1	2	3	2		1	2	3	1
B4		2	2	3	2				3	1	3	2	2	3	
B5					1	2	3	1							
B6	3		3	3	2		3	3		3					1
B7					2	2	1								
B8															
B9			1	3	2				3	2				2	1
B10		1											1	1	
B11			1	3	1	2									
B12											1				
B13												1		1	
B14					1					2				1	2
B15					1					2				1	1
B16	3	2		3						3		1	2		3
B17	2				1					1					1
B18															
B19								3						1	
B20					2	1				1					1
B21					1	1				1					
B22				3	2	2	3		3	1					
B23	2		2		2	2									
B24			1		1	1	2	2		1	1	3			
B25	3														
B26															
B27	3														
B28		2													
B29	2	2													
B30															
B31	2														
B32				2	1	2									
B33					1		2		3	1	3				
B34															
B35															
B36			2		1	2									
B37					2		2			2	1			2	2
B38					1		1			1	2				2
B39		1											1		
B40					1										
B41										1					1
B42		1											1		
B43	3							3							
B44								3							
B45			2	2	1				3	1					
B46		3											3		
B47				3	1					1					
B48															
B49										1					1
B50		2						2		2			2		2
B51					1		1			1					1
B52		3											3		
B53			1		2					1					1
B54														1	
B55	3				1			3		1	3				2
B56								2				2			
B57	3				1					2					1
B58								2		3		1			2
B59					1				3	1	2	2			1
B60					1	1	1	2							

Resources	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8	L 9	L 10	L 11	L 12	L 13	L 14	L 15	L 16
B1	3				2					1	3	1		3		2
B2	1	1	2	2	2						1	2				1
B3	2	2			2								3			
B4	2		2	2	2											3
B5		3	3						2				1	3		
B6	3	3	3	3	3					3			2	3		2
B7		2	1		1							3				
B8	3		2	3					1				2		3	
B9	2	1											1			
B10										1						
B11																
B12													2		1	
B13		3	2		1	2	1	1	3							
B14							2				2					
B15		2			1				1		2	2				2
B16	3	1		1	1		1				2					2
B17			2				1	2			2	2				1
B18								1								
B19							1	1								
B20	3									2	3	2			1	2
B21	2	1					1	3		1		1			1	3
B22	1		1							1		1				
B23												3				
B24	2	2			2	3			1			1				2
B25								1								
B26																
B27								1					1			
B28		3	2				2	1	2							
B29								2			1			3		1
B30						3										2
B31				2			1	1								
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B33	3	3	2						2			2			2	1
B34																
B35						3	1					1			3	3
B36		3	3						2		2		2			
B37						3					2		2	3		1
B38	3	1	2	1					2			2			2	
B39																2
B40	2	1				2				3	2					1
B41	2	1									2		1			1
B42							1	2								1
B43	3	2	2						1	1						
B44	3	1									1					1
B45		3	2							3	2					1
B46																
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B48										2	2	1			1	1
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B50								3			3					2
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B53																
B54										1						
B55	3	1									2					1
B56		2		2							1		3		1	
B57	3	2		2							2	1				
B58	2	1			2						1					
B59	2									2	2		3			3
B60	3	2		2						2	2					

Structure	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S 10	S 11	S 12	S 13	S 14
B1		2	3	3	1	3				1		1	1	1
B2				1	2	1			1					
B3	3			3	3					2	2	2		
B4	3			2	2			3			3			
B5	2			2	2									
B6	1	2	3	2	2	3			3		2			
B7			3	1	1		3							
B8			1	3						1		1		
B9	3			3	3			3						
B10											1			
B11	2													
B12	1													
B13	2					2				3				
B14														
B15				1	1	1			2					
B16				2	2	1			2	1				
B17							3							
B18										2		1		
B19										2		1		
B20				1	1		3					2		
B21				2	2			2						
B22	1											2		
B23	1													
B24	2		3	3	2	3	3		2		2			
B25										3				
B26	1													
B27	3							1						
B28				1			2							
B29				1	1		2							
B30				3	2					1				
B31							1							
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B33				1	1				2					
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B35				3	3			2			2			
B36	3													
B37			3				3				2			
B38							2				2			
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B43	3								2					
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B45		2		1	1			3						
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B48		1		1	1									
B49		1		1	1		2		3					
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B51														
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B56			3					3						
B57				2	2									
B58									2					
B59	3	3	3	3	3		1	3			3			
B60		3	3					1						

Planning	P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	P 11	P 12	P 13	P 14	P 15	P 16	P 17	P 18	P 19	P 20	P 21
B1					1						1			3							1
B2					1																1
B3				1	1		1													1	2
B4				1	1		3	2	1		1				1		2			3	1
B5									1	3	1				1		1				
B6				3		1			3						1		1				1
B7			1	1	1		2	2				1			1		1			2	3
B8							1				2	2	1						1	1	
B9				1	2	2	2	2	1		1				3		3		2	3	1
B10									1	3				3		3					
B11				2				1			1						1				1
B12					1						1		2						1		
B13			1			1									1						
B14								2			2				1						1
B15				2	1	1			1	1	1				2		1				1
B16				2	1		2				1				2		1			2	
B17		2	2	1				1		2	2	2			1						1
B18													1								
B19			3							2											
B20		3			1			1	1		2				1	3			2		1
B21					3		1		1		3	2	2		1	1			3	2	
B22		1									1										1
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B24	2	1	2	1	3		2	1	2		2				1		2			2	1
B25																		2			
B26									1	1							1				1
B27				2	1				1								1		1		
B28	2			3	1	1			1	2		1	1		2						
B29				1		1	1	3		2		3	1	3	3	2					2
B30				1		1		1		3	1			3							
B31																					
B32				2	1	1	2		3	2	2			3		2	3			2	1
B33		3		1		1	1		1						2				1	1	2
B34				3		1	1	1	3	1			2		2		2		2		
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B36				2	1			3	2						2	2			1	1	1
B37	2			3	2	1	1	2	2		2				1		2		3	1	1
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B39											1	3	2				1	3			
B40																					
B41	2		3		1					2			1								
B42								1	3	2		1	3	2			2				
B43																					
B44			2									2	2					3			
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B50								1							1						
B51											2										
B52										1				3					1		
B53				2					1												
B54			2	2	1			1			1			2			1				
B55	1			1	2	1			3		1	2			1		1				1
B56									1												
B57			3					1			1	3	2		1		1				
B58																					
B59				2	1	2		1	2						2		1		1		
B60									1												

Monitoring	MC 1	MC 2	MC 3	MC 4	MC 5	MC 6	MC 7	MC 8	MC 9	MC 10	MC 11	MC 12	MC 13	MC 14	MC 15	MC 16	MC 17
B1		2	2	1	3		1						1			1	3
B2		2			2								1			1	1
B3			1	2	2		1						2			2	1
B4		3		3	1		2	2					1		2	2	1
B5				1				1			3	3	2			1	2
B6		3	3	2	3		1				2		1			2	1
B7	3			1	2		2	3	1				1		3	2	2
B8				2			2	3							2		
B9				3	2		2	2			2	3	3		2	2	1
B10					1						2	1	1		1	1	3
B11		1															2
B12							1	2				1			2		
B13							1	1								1	1
B14		1	1		1		3	3	1						3	1	1
B15		1	1	1	2		1	1					2		1	2	1
B16				2	3		2	2				1		2	2	2	3
B17				1	2		2	2					2	3	2	2	2
B18				1			1						1			1	1
B19				1			1				1	2	1			1	1
B20				1	3	3	2	2	3				3	3	3	1	1
B21				2	2		2	2	2				2		2	1	1
B22					1		1										
B23				2									1			1	1
B24	3			2	1		2	1	1				2			2	
B25						3	2							3		2	
B26										2			1				2
B27	3						1	3							3		1
B28				1			1	2		2	1	2	1		2	1	1
B29			3	1	1	3		1		2	1	3	2	3	2	1	2
B30				1	1			1	1	3	1	3	2			3	2
B31	3						1								1	1	1
B32		2	1	2	1		1	2			3	1	2		2	2	2
B33				2			1						2			1	1
B34					3		2	2	1		1	2	2		2	1	2
B35	3			1	2		1	1			1	3	1			2	1
B36		1	1	1	1		1	1		2			1			1	2
B37				1	3		2	2			3		2		2	2	1
B38					3		1	3			2	2	2		3	1	
B39				1		2							1			1	1
B40				1	1	3	1		3			2	2				
B41			1										2				
B42							1	1					1		1	1	2
B43					1		1						1			3	1
B44					1	3	1						1	3		2	1
B45				1	3		2		3				3			1	1
B46							2				2	3				1	
B47					2		3	3				2			3	1	
B48			3		2		3	2	2				1		2	2	1
B49									1				3			2	2
B50							1	1						3			
B51	3		2		1		2						2			2	2
B52			2		2	3	2	2	2			2	1	2	2	1	1
B53					2		1			3			3				
B54						3	1		1				1	3		1	
B55					3		2										
B56				1	1		1										
B57				1			2	2		3			3		2	2	1
B58				1	1		1						2			1	
B59				2				1	2				3				
B60				1		3	1		1	3	3		3	3		2	1

Improvement	CI 1	CI 2	CI 3	CI 4	CI 5	CI 6	CI 7	CI 8	CI 9	CI 10	CI 11
B1				3			2				2
B2		2	1	1							
B3			2	1	1						
B4			1	3	1		2				
B5		2	1	2							
B6	3	3	2	3	3		3		3		3
B7				3				2	1		
B8		3	3		3					2	
B9			2	3	2						
B10				2							
B11			2	2	2						
B12		3	2		3		1				
B13						2					
B14											
B15				3	2						
B16		2	3	1							1
B17		1	2								
B18											
B19											
B20			2	1		1	2				
B21			1						1		1
B22			1	3							
B23				2	2		1				
B24			2	2		1				1	
B25											
B26			1	2	2						
B27			1	3	3						
B28				1							
B29					2						
B30					1						
B31											
B32				2	2						
B33					1			3			
B34			1	1	2		1				
B35											
B36				1	2				1		
B37			2		2		1	3		2	
B38	3		1	3					2	2	
B39				1		2					
B40	2			1					3		
B41											
B42				2	1	2					
B43			2				3		1		
B44		3	3				2		2		
B45			1	2	2	2					
B46											
B47			2	3	3	1		3		1	1
B48							3				
B49	3		2		2	1	1	3			
B50			2								2
B51	3		2								
B52	3						2				
B53		1		1		3		3	3		
B54					3		1				
B55	3		2	2	3				3	3	
B56	3		1	1		1	1			1	
B57	3		1	1					3	3	2
B58			3	1	2	1					1
B59			1	1	3				2		3
B60	3	3	2	1	1		3				

Appendix C:

Sample of a Corporate Productivity Program Assessment Report

Example Assessment Report

Corporate Productivity Program

Construction Industry Institute – Research Team 340

Corporate Best Practices for Successful Productivity Program Improvement

(date)

Contents

Case Study Development

Example had 18 fictional responses to the Program Assessment Survey.

Researchers produced the outputs based on survey data.

Outputs

1. Program Scores
2. Program Strong and Weak Actions
3. Potential Program Barriers
4. Misalignments

Action Maturity Model Scoring		
Initial	Action is not performed OR rarely performed	1
Inconsistent	Action is performed inconsistently	2
Defined	Action is understood but inconsistently performed	3
Mature	Action is understood and consistently performed	4
Optimal	Action is understood, consistently performed, and has been optimized over time	5

Program and Case Study Clarifications

- This is not a benchmarking system
  - Not designed to compare between companies
  - Not a fixed metric (e.g., no productivity version of TRIR)
- Full implementation is recommended to be led by executive management over one or two days to allow time for discussion, alignment, and action planning
- Implementation and improvement of a Corporate Productivity Program is a long-term objective, similar to safety improvement
  - However, it is expected that assessment may identify “low-hanging fruits”
  - Implementation Plans are anticipated to be company specific efforts that require executive leadership to create portfolio-wide improvement

Scoring Calculations:

- **Action Scores** are the average numeric value of responses to each Action
  - Initial (1), Inconsistent (2), Defined (3), Mature (4), and Optimal (5).
- **Element Scores** are calculated by averaging the values for each Element’s Action Scores.
- **Program Score** is the average of the Element Scores.

Program Score Overview

Program Average	2.9
Leadership	2.6
Resources	3.1
Structure and Communication	3.0
Planning for Productivity	2.8
Productivity Monitoring and Control	2.8
Continuous Improvement	3.1

Program Scores – Program and Element Levels

Element Score Review

Action and Element Scoring Notes:

1. The numbers in the table indicate the number of responses for each maturity level; the Action Score is the average response value.
2. *Strong Action Scores (>=3.5) are highlighted **green***
3. *Weak Action Scores (<=2.5) are highlighted in **red***

LEADERSHIP Action Description	Action Score	Detailed Assessment Initial ---> Optimal				
L 1 Promote productivity culture.	3.0	1	4	7	6	0
L 2 Define productivity metrics.	2.9	3	1	9	5	0
L 3 Set productivity goals.	2.6	3	5	6	4	0
L 4 Ensure productivity goals support business objectives.	2.6	5	2	6	5	0
L 5 Align corporate leadership on productivity goals.	2.6	3	6	4	5	0
L 6 Circulate productivity plans for buy-in and feedback.	2.6	4	2	10	2	0
L 7 Take ownership of productivity improvement.	**2.2**	7	4	4	3	0
L 8 Display commitment to productivity goals.	2.7	5	1	6	6	0
L 9 Communicate productivity goals consistently.	2.8	2	3	9	4	0
L 10 Recognize productivity successes at the corporate level.	2.7	5	3	3	7	0
L 11 Promote the implementation of productivity practices across the project portfolio.	**1.8**	10	2	6	0	0
L 12 Designate corporate champions with leverage to improve practice utilization.	2.9	2	3	8	5	0
L 13 Provide corporate resources to support project implementation of productivity practices.	2.8	2	6	4	6	0
L 14 Align project leaders on productivity goals.	**2.0**	7	6	3	2	0
L 15 Recognize productivity successes at the project level.	2.7	4	3	5	6	0

RESOURCES Action Description	Action Score	Detailed Assessment Initial ---> Optimal				
R 1 Promote the implementation of productivity practices.	**2.2**	7	2	7	2	0
R 2 Train and develop corporate personnel to properly address productivity.	3.4	0	1	8	9	0
R 3 Assign qualified personnel for positions that manage productivity practices.	**3.8**	0	2	6	4	6
R 4 Allocate time for corporate personnel to perform duties relative to productivity.	**3.5**	0	0	9	9	0
R 5 Hold corporate personnel accountable for their roles with productivity goals and practices.	3.4	0	1	10	6	1
R 6 Require training and development of project personnel on productivity practices.	3.4	0	0	11	6	1
R 7 Ensure project personnel fully understand and support productivity practices.	3.2	0	3	9	5	1
R 8 Ensure project teams are capable of defining and measuring productivity.	3.2	0	2	11	4	1
R 9 Ensure individual capabilities and qualifications are in place for positions that manage productivity practices.	3.2	0	3	9	5	1
R 10 Demand productivity practices create information that is used in decision making.	**2.2**	7	2	7	2	0
R 11 Provide historical data and lessons learned needed for productivity practices.	**3.7**	0	1	6	8	3
R 12 Fit or adjust productivity practices based on project size and complexity.	2.9	3	4	4	6	1
R 13 Provide funding for efforts toward productivity goals.	3.3	0	1	10	7	0
R 14 Dedicate funds to the analyses of productivity practices during project front end planning.	3.3	0	1	10	7	0
R 15 Provide technology and tools needed for the implementation or productivity practices.	2.6	5	2	8	1	2
R 16 Establish interfaces between productivity systems and corporate systems supporting other functions.	**2.4**	5	3	8	2	0

STRUCTURE AND COMMUNICATIONS Action Description	Action Score	Detailed Assessment Initial ---> Optimal				
S 1 Align corporate functions or departments on corporate productivity goals.	2.4	5	4	6	3	0
S 2 Share productivity reports across functions, disciplines, and groups.	2.9	0	7	6	5	0
S 3 Create an organizational strategy supporting productivity goals.	2.3	3	8	6	1	0
S 4 Establish clear interfaces between the corporate departments regarding productivity practice implementation.	2.7	0	6	11	1	0
S 5 Ensure other corporate programs understand their impact and roles regarding productivity.	2.9	0	8	3	7	0
S 6 Communicate roles and responsibilities within productivity practices for corporate personnel.	3.0	0	5	8	5	0
S 7 Provide corporate personnel to support project teams in the implementation of productivity practices.	3.2	0	3	8	7	0
S 8 Establish interdisciplinary and cross-functional collaboration to enable achievement of productivity goals.	3.1	0	3	11	4	0
S 9 Hold corporate personnel accountable for their productivity practice responsibilities.	3.2	0	3	8	7	0
S 10 Establish a company hiring process that supports productivity goals.	2.7	3	5	4	6	0
S 11 Expect alignment of project groups or teams on project productivity goals.	3.2	0	3	8	7	0
S 12 Promote collaboration of personnel from various backgrounds through productivity interfaces.	3.4	0	0	11	6	1
S 13 Consider cultural backgrounds when leveraging productivity practices.	3.3	0	3	7	7	1
S 14 Manage language barriers to productivity practices implementation.	3.3	0	3	8	6	1

PLANNING FOR PRODUCTIVITY Action Description		Action Score	Detailed Assessment Initial ---> Optimal				
P 1	Document key processes and procedures for productivity practices.	3.0	0	6	6	6	0
P 2	Make productivity practices readily available to project personnel.	2.7	1	7	6	4	0
P 3	Guide project implementation of productivity practices.	2.7	1	8	4	5	0
P 4	Require alignment meetings between groups and companies that interface with project productivity practices.	3.2	0	4	7	6	1
P 5	Establish company-wide procurement and materials management practices and expectations.	**2.1**	4	8	6	0	0
P 6	Ensure that project operating or owner organizations are engaged throughout project life-cycle.	2.6	2	8	3	5	0
P 7	Ensure safety professionals' input is leveraged to improve productivity practice implementation.	**3.7**	0	0	5	9	4
P 8	Require risk assessments prior to project execution and implementation of productivity practices.	3.2	0	2	10	6	0
P 9	Leverage project delivery methods and contracting strategies that pursue productivity goals and business objectives.	3.2	0	2	10	6	0
P 10	Demand that change management procedures be consistently utilized on projects.	**2.4**	2	9	5	2	0
P 11	Establish systems to improve the interface between construction and engineering.	**1.8**	7	8	2	1	0
P 12	Ensure front end planning, engineering, and procurement activities consider productivity goals.	2.6	1	10	3	4	0
P 13	Expect projects to package project construction, engineering, and installation work documents to enable productive construction.	2.8	0	8	6	4	0
P 14	Implement project controls systems and roles consistently.	2.9	0	7	6	5	0
P 15	Demand projects plan early for construction, commissioning, and start-up relationships.	2.6	0	7	11	0	0

PLANNING FOR PRODUCTIVITY Action Description		Action Score	Detailed Assessment Initial ---> Optimal				
P 16	Confirm that project evaluate schedules considering productivity impacts.	2.9	0	6	7	5	0
P 17	Establish pre-fabrication, modularization, and off-site fabrication evaluations to capture productivity benefits for projects.	**1.6**	8	10	0	0	0
P 18	Demand that projects plan site layouts to increase craft time on tools and productivity.	3.0	0	5	8	5	0
P 19	Support project materials management functions on projects.	**2.0**	4	10	4	0	0
P 20	Establish quality management systems and practices on projects.	3.2	1	2	7	8	0
P 21	Adjust expectations of productivity practice utilization based on project size and complexity.	3.2	0	0	14	4	0

PRODUCTIVITY MONITORING AND CONTROL		Action Score	Detailed Assessment Initial ---> Optimal				
	Action Description						
MC 1	Implement practices to check productivity performance on projects.	2.7	0	7	10	1	0
MC 2	Establish key productivity performance indicators for projects.	3.2	0	5	5	8	0
MC 3	Track key productivity performance indicators throughout the project life.	2.7	0	8	7	3	0
MC 4	Align quality management with productivity goals.	3.2	0	4	6	8	0
MC 5	Track projects utilization of productivity practices to verify practice performance.	**2.5**	0	11	5	2	0
MC 6	Ensure projects evaluate direct work or unit rates to know how and where productivity is lost.	2.6	1	8	6	3	0
MC 7	Provide support for project evaluation of craft time on tools and work-hours.	2.6	1	8	6	3	0
MC 8	Expect projects to evaluate equipment utilization to validate equipment needs.	2.9	1	5	7	5	0
MC 9	Collect productivity performance metrics data from projects.	2.6	1	8	6	3	0
MC 10	Provide benchmarking data to monitor performance based on project location and scope norms.	3.2	0	5	5	8	0
MC 11	Ensure project decision makers are aware of productivity impacts.	3.3	0	3	6	9	0
MC 12	Ensure project decision makers are aware of subsequent safety, quality, cost, and schedule impacts.	3.2	0	4	8	4	2
MC 13	Require that project teams to leverage productivity information when making decisions for impacts and options.	2.7	1	8	5	4	0
MC 14	Expect projects to make craft productivity, planning, and execution information readily available and visible so craft teams know how they are performing.	**2.1**	4	9	4	1	0
MC 15	Ensure projects evaluate equipment utilization and needs during project execution.	2.9	1	5	7	5	0
MC 16	Provide resources to reduce and manage rework on projects.	3.0	2	2	8	6	0
MC 17	Ensure project recovery plans consider productivity impacts on business outcomes.	**2.4**	1	13	0	4	0

CONTINUOUS IMPROVEMENT Action Description		Action Score	Detailed Assessment Initial ---> Optimal				
CI 1	Track and improve productivity through a continuous improvement program.	3.0	0	4	10	4	0
CI 2	Encourage development or use of new or innovative productivity practices.	**3.6**	0	1	8	7	2
CI 3	Support technology investigation and innovation.	3.1	0	5	7	6	0
CI 4	Analyze the risk-reward impacts of using productivity practices for company, projects, and individuals.	2.7	1	6	9	2	0
CI 5	Use pilot projects to test new or innovative approaches to productivity improvement.	**3.8**	0	1	7	5	5
CI 6	Collect and analyze productivity metrics for future planning and improvement.	**3.8**	0	0	7	8	3
CI 7	Establish a feedback cycle for productivity practices performance.	3.2	0	3	9	6	0
CI 8	Utilize productivity practice performance data to improve their utilization.	2.8	0	7	8	3	0
CI 9	Capture, analyze, and disseminate lessons learned related to productivity.	3.1	0	4	9	5	0
CI 10	Disseminate productivity practice successes to project teams.	3.1	0	3	11	4	0
CI 11	Highlight and distribute productivity performance data throughout company and with business partners.	2.6	2	6	7	3	0

Potential Program Barriers

To identify potential Program Barriers, we look at weak Actions that we want to improve. The weak Actions are cross-referenced with the Barrier list and relationships.

Relationships Level:

- 1 Low
- 2 Medium
- 3 High

Top Barriers to Monitoring and Control Action #14

Action	Action Description	Score
MC 14	Expect projects to make craft productivity, planning, and execution information readily available and visible so craft teams know how they are performing.	**2.1**

Ct	Potential Barrier	Relation Level
B16	Performance in organizations is not well tied to recognition, especially at productivity scope levels.	2
B17	Project personnel are overwhelmed with daily work, limiting identification and management of productivity impacts.	3
B20	Programs and systems cannot be accessed by people who need the information.	3
B25	Projects frequently struggle to form relationships with craft labor interfaces.	3
B29	Project schedules lead to being behind and rushing project phases, over staffing, and other adjustments that hinder productivity.	3
B44	Craft feedback is not used to capture productivity improvement opportunities on most company sites.	3

Top Barriers to Leadership Action #11

Action	Action Description	Score
L 11	Promote the implementation of productivity practices across the project portfolio.	**1.8**

Ct	Potential Barrier	Relation Level
B4	Goals developed at the department level without overarching corporate objectives as guidance.	3
B33	Lack of consistent corporate work practices make transitions between groups and projects more difficult.	3
B55	Energy to move productivity practices forward from project to project fades over time, losing support and emphasis.	3
B2	Corporate goals for productivity improvement become stale or overbearing as each year is, “Improve on last year.”	2
B38	Specific productivity practices are implemented inconsistently by each project team.	2
B59	Organizational silos prevent productivity practice improvements because knowledge is not transferred.	2
B12	High costs of construction technology and training prevent adoption of new technology by the organization.	1
B24	Corporate support functions have low influence on project utilization of productivity practices.	1
B37	Company project teams are not convinced the benefits of implementing practices are worth the cost and effort.	1
B44	Craft feedback is not used to capture productivity improvement opportunities on most company sites.	3

Misalignment

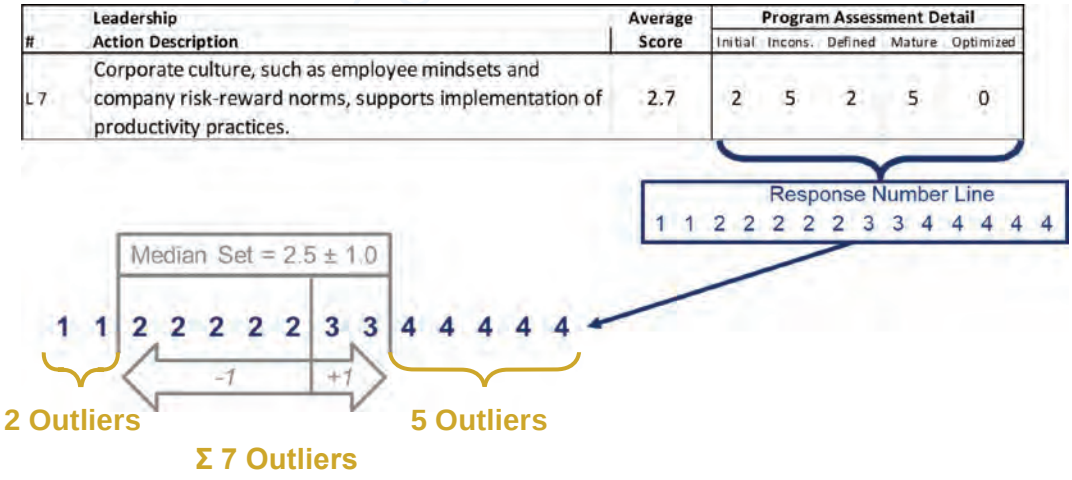
Misalignment of perspectives on program Actions is another important metric. Misalignment identifies potential improvement areas of the Corporate Productivity Program consistency and awareness. Through discussion of different perspectives, participants can address organizational silos, best practices, and program deficiencies.

Here misalignment is represented by a count of outliers. Outliers are responses that are more than a full maturity level away from the median response. This value helps by identifying which Actions have misaligned perspectives, which should be discussed by participants to understand the inconsistency.

In all Corporate Productivity Program calculations, the maturity level is quantified linearly, as Initial (1), Inconsistent (2), Defined (3), Mature (4), and Optimal (5). For misalignment, these values can be viewed as a number line. The median value is used to identify the middle response, and a range of ±1 from this middle response is considered aligned. The responses that are not in the ±1 range are misaligned. For example, if the median is "Defined" (3) then perspectives of "Initial" (1) or "Optimal" (5) are outside the ±1 level of maturity away. These outliers are counted to generate a misalignment value.

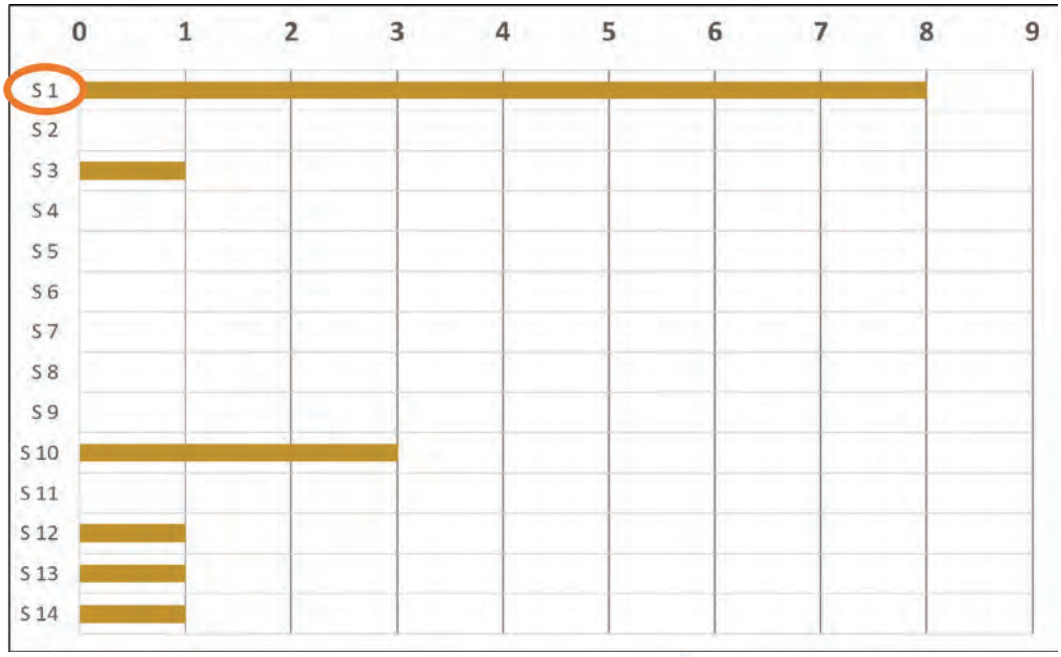
An example of this methodology is outlined below. For evaluation across many responses to the 94 Actions, Excel or similar software is recommended.

Misalignment Calculation Example



Thus, Leadership Action #7 has seven outlier responses.

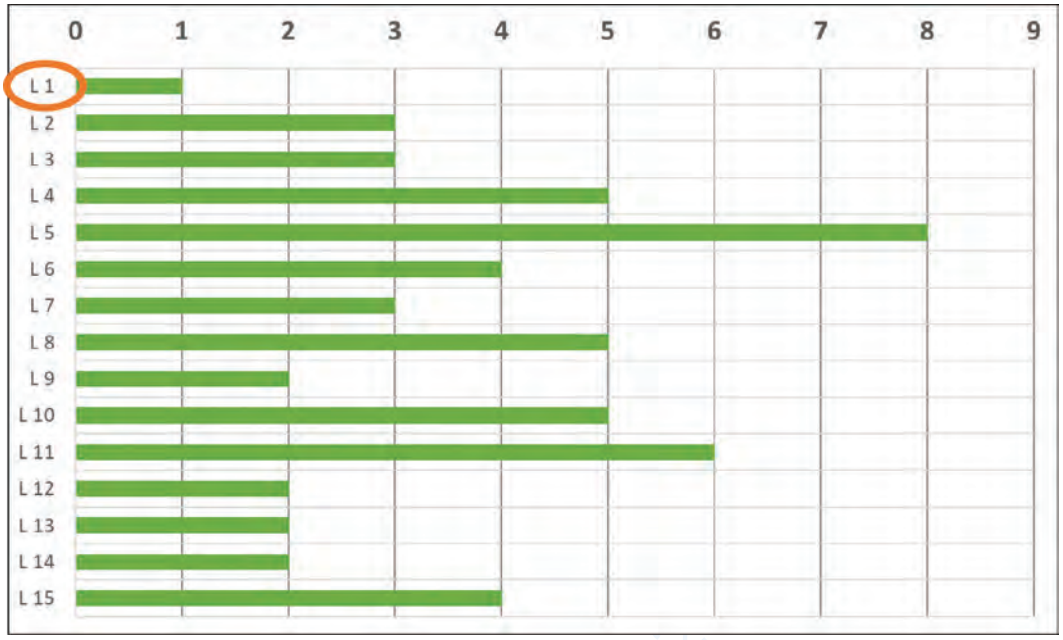
Structure and Communication Misalignment



Structure and Communication Action #1 Misalignment

Action	Action Description	Score	Outliers
S 1	Align corporate functions or departments on corporate productivity goals.	2.4	8

Leadership Misalignment



Leadership Action #5 Misalignment

Action	Action Description	Score	Outliers
L 5	Align corporate leadership on productivity goals.	2.6	8

Program Implementation Framework Next Steps

This discussion and assessment is conducted to identify areas to focus enterprise improvement and focus from the corporate-level.

Outline of Implementation Planning

- Capture program improvement discussion points.
- Assign improvements to champions or groups:
  - Identify root causes of deficiencies.
  - Develop improvement implementation plans.
  - Cycle for feedback and adjustment.
- Conduct program assessments roughly annually to diagnose weak Actions.
- Celebrate accomplishments!

Notes

Notes

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