

How Construction Employers Develop, Verify, and Sustain Workforce Capability

Report 4 in Volume 1 of the *Multiskilling in the U.S. Construction Industry* research series



About the Simplar Foundation

The Simplar Foundation is a collaborative team of university faculty and researchers whose mission is to discover, share, and promote research findings that enable organizations of all types and sizes to improve their ability to operate, better meet the public need, implement best practices, and more effectively train the workforce. Learn more at simplarfoundation.org.

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How Construction Employers Develop, Verify, and Sustain Workforce Capability

Report 4 of 6 in Volume 1

Multiskilling in the U.S. Construction Industry

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About the Series

This report is one of six reports in Volume 1 of *Multiskilling in the U.S. Construction Industry*. The series examines multiskilling through distinct research questions, evidence sources, and analytical methods. Volume 1 includes the largest field-collected dataset assembled to date on multiskilling as practiced in active U.S. construction projects and operations. It also includes controlled field trials, project records, evidence on employer workforce capability systems, a comprehensive review of peer-reviewed literature, and contractor safety context.

The research was conducted by the Simplar Foundation in collaboration with researchers affiliated with the University of Kansas, the University of North Carolina at Charlotte, and Arizona State University. Each report is designed to be read independently while contributing to the combined evidence base.

All published reports and related resources are available at the Simplar Foundation's Multiskilling Knowledge Center (simplarfoundation.org/multiskilling).

Reports in Volume 1: Evidence on Project Performance

01 Work-Time Utilization and Staffing Level Impacts in Construction Crews

02 Productivity in Multi-Trade Construction Workflows

03 Schedule Duration and Labor-Curve Outcomes

04 **How Construction Employers Develop, Verify, and Sustain Workforce Capability**

THIS REPORT

05 A Comprehensive Review of Prior Evidence

06 Contractor Safety Context

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How Construction Employers Develop, Verify, and Sustain Workforce Capability

Report 4 in Volume 1 of the *Multiskilling in the U.S. Construction Industry* research series

48

participating organizations

80

interviews across 18 trades

23

headquarters states

25

training-facility, project, and site visits

KEY FINDINGS

- 1 Training is an activity. Capability is the outcome.** Training becomes useful capability when workers demonstrate that they can perform the defined work technically, safely, to the required quality, and at the productive level the project requires — with readiness verified, documented, and connected to real assignments.
- 2 The system is the story.** The strongest programs recruit, develop, verify, deploy, refresh, and advance workers as parts of one connected system — orchestrating outside curricula, apprenticeship, colleges, and other partners into work-ready capability.
- 3 Verified capability is the foundation for multiskilling.** Capability assurance integrates safety, quality, and productive performance into one standard of readiness; multiskilling is a verified application of that foundation.
- 4 Capability builds careers and delivery capacity at once.** In one company-record analysis, workers who participated in development were about twice as likely to remain employed at two years and ten times as likely at ten or more years.

Six Core Functions of Employer-Embedded Workforce Capability Systems

1
Govern and invest in
capability

2
Recruit and prepare workers
for entry

3
Develop capability through
blended learning

4
Assess, document, and
maintain readiness

5
Deploy capability for project-
specific needs

6
Convert capability into
careers, leadership, and
workforce continuity

CAPACITY CREATED

Worker capability and opportunity

Employer and project capacity

Public delivery capacity

The six core functions of employer-embedded workforce capability systems.

Executive Summary

This report examines how construction employers develop, verify, deploy, refresh, and advance workforce capability. Its central finding is straightforward: **training is an activity; capability is the usable outcome.** Strong coursework and curriculum provide an essential foundation. Blended learning gives workers opportunities to understand, practice, apply, and refine what they learn. Capability assurance then verifies the result by demonstrating and documenting that a worker can perform defined work technically, safely, to the required quality, and at the productive level the project requires, while holding any necessary current credentials or authorization. Readiness becomes operational when it is connected to an appropriate assignment.

The study used a purposive qualitative design and drew on 48 participating organizations and 80 interviews. Participants represented 18 trades, and participating organizations were headquartered across 23 states. Researchers also completed seven visits to employer training facilities and 18 project or site visits involving interviews. Evidence included interviews and field discussions, observations of learning and work environments, selected company records and program materials, and structured cross-case synthesis.

Across organizations of different sizes and types, the research identified six recurring functions of employer-embedded workforce capability systems:

- 1 Govern and invest in capability.
- 2 Recruit and prepare workers for entry.
- 3 Develop capability through blended learning.
- 4 Assess, document, and maintain readiness.
- 5 Deploy capability for project-specific needs.
- 6 Convert capability into careers, leadership, and workforce continuity.

EVIDENCE BASE AT A GLANCE

48

participating organizations

80

interviews

18

trades represented

23

headquarters states

7

employer training-facility visits

18

project or site visits involving interviews

These functions operated as connected parts of one system rather than as isolated programs. Organizational investment supported worker entry and development. Instruction, demonstration, coached practice, repetition, simulation, field experience, and feedback built capability. Assessment and records established readiness. Deployment connected verified capability to project needs. Career progression allowed experienced workers to become coaches, assessors, instructors, supervisors, and leaders who helped sustain the next generation.

The systems took different organizational forms. Some employers operated staffed training institutes and simulated work environments. Others used modest shops, mobile classrooms, digital learning, practitioner instructors, educational partnerships, association programs, or shared facilities. The defining feature was not the size of the facility. It was the employer's ability to connect people, partners, learning resources, standards, assessment, records, project demand, assignments, and career pathways. **Employer-embedded does not mean employer-only.** It means the employer orchestrates the pieces into a working system tied to real work.

Capability assurance makes that system operational. It links standards, instruction, practice, demonstration, verification, records, authorization, assignment, supervision, review, and refresh. It also connects technical proficiency, safe execution, quality workmanship, and productive performance to project-specific readiness. Capability creates project value when the right verified worker is assigned to the right work, under the appropriate conditions and supervision, at the time the capability is needed.

This finding clarifies the relationship between workforce development and multitasking. **Capability is the foundation; multitasking is one qualified application.** Multitasking is not asking one person to do everything or allowing informal task switching. It means assigning selected work across more than one trade, craft, or skill classification only when the worker is competent, current, and authorized. The same capability system can also support deep specialization, equipment qualification, fabrication, project-specific preparation, coaching, and leadership.

The systems documented in the study can create two connected forms of capacity. Workers can gain clearer entry pathways, visible standards, invested coaches, documented achievement, greater continuity of work, and additional career choices. Employers, projects, owners, and public stakeholders can gain a stronger base of verified capability for current and future work. The value is shared because worker growth becomes part of the organization's ability to perform needed work and preserve knowledge over time.

The study was not designed to estimate how common these practices are across the entire U.S. construction industry or to establish causal effects on safety, quality, productivity, wages, retention, or project outcomes. The sample was purposive, the depth of evidence varied across cases, and company records were not uniform. The appropriate conclusion is therefore system-level: construction employers can function as learning organizations that turn training into demonstrated readiness, readiness into responsible work, and experience into opportunity, leadership, continuity, and delivery capacity.

SECTION 1

From Training to Capability

This report examines how construction employers develop, verify, deploy, refresh, and advance workforce capability. The central focus is not a single course, credential, or training event. The focus of this study is the holistic operating system that connects learning to demonstrated readiness, project assignment, career progression, and organizational continuity.

Training Is an Activity. Capability Is an Outcome.

Training creates opportunities to learn. The usable outcome of effective training is the increase in capability gained by the trainee. The increase in capability includes the knowledge and practical ability required to perform defined work, along with applicable safety understanding, demonstrated quality, productive performance expectations, current authorization, and tracking of the corresponding credentials.

The distinction matters because construction employers do not rely only on attendance or course completion when assigning work. Across the participating cases, learning was connected to coaching, practice, demonstration, assessment, records, field assignment, refresh, and advancement.

Figure 1 distinguishes a training activity from the larger system that converts learning into usable capability.

Training Activity vs. Capability System

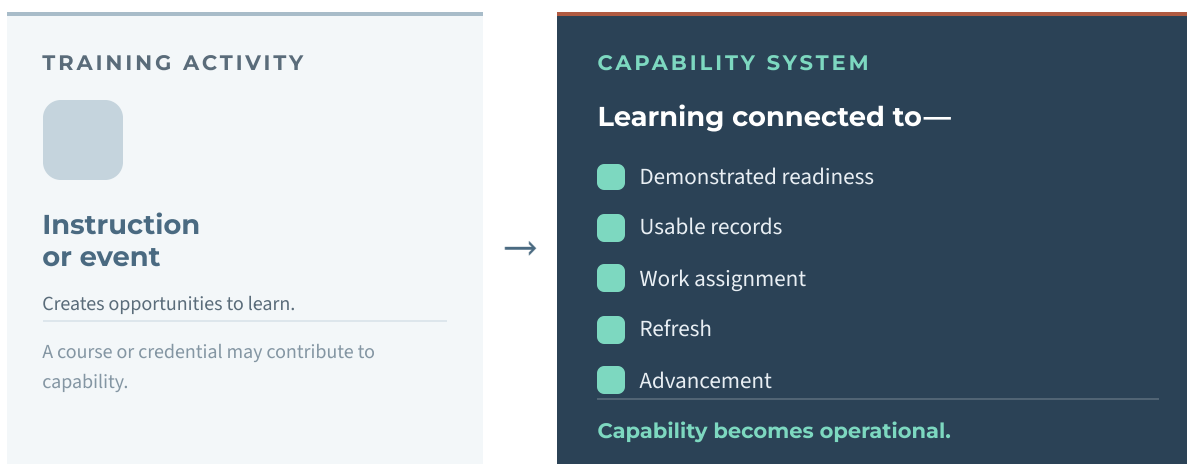


Figure 1. Training Activity vs. Capability System. Training activities matter because they create opportunities to learn, but capability becomes operational only when learning is connected to demonstrated readiness, usable records, work assignment, refresh, and advancement. The figure preserves the report's central distinction between an activity and the system that turns learning into field-ready capability.

The comparison establishes the report threshold: a course or credential may contribute to capability, but the system must also connect learning to demonstration, records, assignment, refresh, and advancement.

Two Forms of Capacity

Employer-embedded capability systems can create two forms of capacity at the same time. First, they create worker capability and opportunity by giving people clearer pathways into construction, stronger preparation, visible standards, documented achievement, and ways to grow over time.

Second, they create employer, project, owner, and public delivery capacity by helping organizations prepare qualified workers for current and future work. This is especially important for projects to achieve safe execution, quality workmanship, schedule reliability, and an adaptable workforce.

Figure 2 shows how the same capability system can support worker opportunity and delivery capacity without treating those outcomes as interchangeable.

Two Forms of Capacity



Figure 2. Two Forms of Capacity. Employer-embedded workforce capability systems can create worker capacity and delivery capacity at the same time. Workers gain clearer pathways for readiness, growth, continuity, and advancement, while employers, projects, owners, and public stakeholders gain a stronger base of verified capability for the work ahead.

The two forms of capacity are connected. Worker growth expands the capability available to employers and projects, while sustained work and development opportunities give that capability meaning for workers.

What This Report Examines

The report identifies six recurring core functions of employer-embedded workforce capability systems. It explains how these functions operate, shows real examples from the participating sample, and translates the findings into practical implications for contractors, workers, owners, policymakers, and taxpayers.

Although this report documents evidence of how capability systems were organized and used in the participating sample, it does not claim that every construction employer operates the same system, nor does it attribute companion-report project outcomes to training alone. The nationwide study gathered evidence from dozens of employer-embedded workforce capability systems. This section will define what these systems are before the following section describes the methodology and data set in greater detail.

SECTION 2

Employer-Embedded Workforce Capability Systems

Working Definition

An employer-embedded workforce capability system is a sustained, employer-orchestrated arrangement of people, partnerships, curricula, learning environments, assessment practices, records, and career mechanisms through which a construction firm recruits, develops, verifies, deploys, refreshes, and advances worker capability in response to project and workforce needs.

Employer-embedded does not mean employer-only. The systems documented in this study often connected internal leaders, instructors, coaches, field practitioners, registered apprenticeship, association programs, colleges, high schools, industry curricula, digital learning, and other partners. The employer's distinctive role was to connect those pieces to work, readiness, assignment, and advancement. Several terms in this report have specific meanings. Please refer to [Appendix A](#) for a list of the key terms used throughout this report. Several terms in this report have specific meanings. Please refer to [Appendix A](#) for a list of the key terms used throughout this report.

Capability Lifecycle

The capability lifecycle begins when an employer senses workforce and project needs. The system then recruits, prepares, develops, assesses, deploys, refreshes, and advances workers. Feedback from projects, workers, technology, field leaders, and experienced practitioners returns to the system and helps shape the next cycle.

[Figure 3](#) organizes the recurring lifecycle and the feedback that keeps the system responsive to work and workforce needs.

Lifecycle and Continuous Feedback



Figure 3. Capability-System Lifecycle and Continuous Feedback. The capability lifecycle begins with workforce and project needs and continues through recruitment, preparation, development, assessment, deployment, refresh, and advancement. Feedback from projects, workers, changing technology, and experienced practitioners helps the system improve over time.

The cycle is not a required sequence for every worker. It is a system-level model showing how employer decisions, worker development, project experience, and advancement can reinforce one another.

Four Layers of Capability

The cases showed that capability is layered. Foundational trade education provides broad knowledge and basic preparation. Employer-specific capability connects that foundation to company standards, internal work methods, safety practices, quality expectations, tools, technology, and culture. Project-specific readiness prepares workers for the conditions and sequence of the work ahead. Career and leadership capability extends growth into coaching, assessment, supervision, instruction, and other advanced roles.

Figure 4 distinguishes four complementary layers of capability.

Four Layers of Workforce Capability



COMPLEMENTARY LAYERS, READ FROM THE BASE UP

Figure 4. Four Layers of Workforce Capability. Workforce capability develops through complementary layers. Foundational trade education provides the base. Employer-specific capability connects that base to company standards and work methods.

The layers clarify why external education and employer development are complementary. Foundational preparation establishes a base, while employer, project, and career layers connect that base to the work and opportunities ahead.

Employer Orchestration

Employer orchestration is the organizing role that makes the system employer-embedded. The employer does not need to own every classroom, curriculum, credential, or learning resource. Its role is to organize, connect, apply, and maintain the system so that capability is visible and usable in the field.

Figure 5 shows the employer as the orchestrator of internal and external capability resources.

Employer as Capability-System Orchestrator

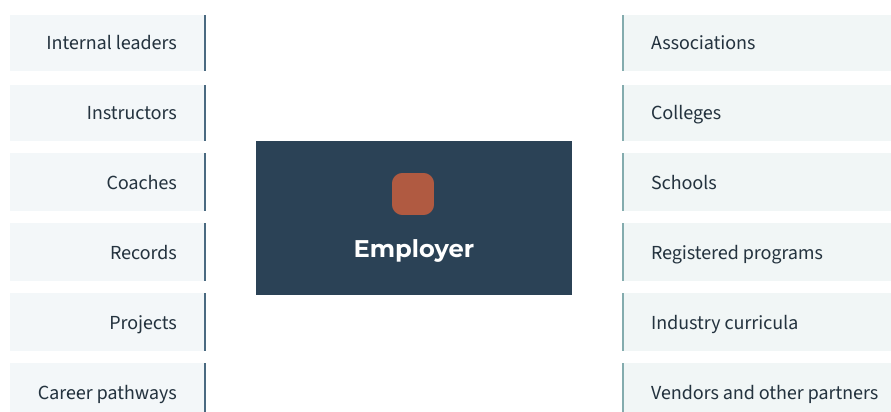


Figure 5. Employer as Capability-System Orchestrator. Employer-embedded does not mean employer-only. The employer's distinctive role is to connect partners, curricula, learning environments, records, project demand, field assignment, and career mechanisms so that development becomes usable capability within the organization.

The model keeps the construct employer-embedded without implying employer-only delivery. The defining role is the connection among learning resources, verified readiness, field use, and career progression.

Conceptual Contribution

The conceptual contribution of this report is a shift in the unit of analysis relative to prior research. Instead of examining primarily educational institutions that train construction workers, this report examines construction organizations as learning organizations that develop, verify, maintain, and apply workforce capability.

This framing supports the broader research series. This report explains how capability is created and maintained. Companion reports examine selected crew, workflow, staffing, schedule, and safety contexts that qualified capability may enable, especially in a multiskilling labor strategy.

Prior construction research has described multiskilling as flexible deployment beyond a primary trade or work process and has examined crew composition, worker assignment, implementation, and training (Burleson et al., 1998; Gomar et al., 2002; Haas et al., 2001; Nasirian et al., 2019a). Much of that literature begins with workers who already possess, or are assumed to possess, additional skills. This study examines the organizational system that develops, verifies, maintains, and applies that capability.

A background image showing three construction workers in a meeting. A man in the center, wearing glasses and a yellow safety vest over a light blue shirt, is looking thoughtfully to the right. Two other workers, also in safety vests, are partially visible on either side of him. They are seated at a table with water bottles and coffee cups.

SECTION 3

Research Objectives and Methodology

The methodology was designed to identify recurring system functions and representative cases while preserving evidence boundaries, anonymity, and the distinction between participant evidence and researcher synthesis.

The evidence came from interviews, on-site visits to training facilities, project-based interviews, researcher observations, and selected company records. A structured cross-case synthesis was used to identify the recurring practices, operating relationships, and worker and project implications presented in the report.

Study Purpose and Research Questions

The purpose of the study was to examine how construction employers create and sustain workforce capability as an organizational system.

The study addressed three research questions:

- 1 How do construction employers organize and sustain systems for developing workforce capability?
- 2 How do these systems develop, verify, document, deploy, refresh, and advance worker capability in response to project and workforce needs?
- 3 What recurring operating functions and practical implications emerge across the participating sample for workers, employers, projects, owners, and public workforce policy?

The first question focuses on the organizational infrastructure behind capability development. The second follows capability through its operating lifecycle. The third examines the broader meaning of recurring practices for the principal audiences of the report.

Evidence Base and Study Sample

The evidence base included 48 participating organizations and 80 interviews. Participants represented 18 different trades, and participating organizations were headquartered across 23 states. The research also included seven visits to employer training facilities and 18 project or site visits involving interviews.

Figure 6 summarizes the scale and reach of the evidence base used to develop the capability-system framework.

Evidence Base at a Glance



Figure 6. Evidence Base at a Glance. The study draws on 48 organizations, 80 interviews, 18 trades, 23 headquarters states, seven training-facility visits, and 18 project or site visits involving interviews. Together, these sources allowed the research team to examine capability systems at organizational, learning-environment, field, and worker levels.

The participating organizations included general contractors, self-performing contractors, specialty contractors, industrial and infrastructure firms, and industry organizations that provided workforce-development context. Interview participants included company leaders, workforce-development personnel, instructors, project managers, supervisors, field leaders, craft professionals, workers, administrative staff, and human resources professionals.

Together, these sources provided evidence about how capability systems were organized, how workers learned, how readiness was assessed and documented, how project needs shaped development, and how workers experienced the resulting pathways.

Data Sources and Collection

The study drew on three primary forms of evidence.

Interviews and Field Discussions

Interviews were conducted with company leaders, workforce-development personnel, instructors, project managers, supervisors, field leaders, craft professionals, workers, administrative staff, and human resources professionals. Conversations occurred through dedicated interviews, training-facility visits, project visits, and related field discussions.

Interview topics included:

- Organizational responsibility and investment
- Curriculum selection and employer-specific content
- Craft and leadership assessment
- Project-specific preparation and worker assignment
- Workforce continuity and future development needs
- Recruitment and entry preparation
- Instruction, coaching, mentorship, simulation, and field learning
- Records, credentials, authorization, and renewal
- Career progression, recognition, compensation, and leadership

Training-Facility and Project Observations

Training-facility visits allowed researchers to observe classrooms, shops, fabrication areas, equipment-practice areas, simulated work environments, mock-ups, digital learning systems, assessment stations, and interactions among instructors, workers, and program leaders.

Project and site visits added evidence about how workforce capability was discussed and applied in active work environments. These visits included interviews with field personnel and observations of work planning, worker roles, supervision, and selected workforce practices.

Selected Company Records and Program Materials

Participating organizations supplied selected materials that supported interview and observation evidence. Depending on the case, these materials included:

- Training calendars and course information
- Assessment criteria and practical checklists
- Learning-system information
- Retention analyses
- Participation or completion records
- Certification or qualification records
- Career-pathway materials
- Internal process documents

Qualitative Synthesis and Development of the Six Core Functions

The research team used a structured qualitative synthesis to organize and compare the evidence. The process included five steps.

1 SOURCE CATALOGING

Relevant observations, practices, participant statements, records, statistics, worker perspectives, and proposed implications were cataloged in a structured evidence registry.

2 CROSS-CASE COMPARISON

Similar practices were compared across employers, contractor types, learning environments, and evidence sources.

3 RECURRING-THEME IDENTIFICATION

The research team identified repeated patterns concerning organizational responsibility, recruitment, development, assessment, deployment, career progression, and workforce continuity.

4 EVIDENCE CLASSIFICATION

Proposed findings and cases were classified according to source, evidence strength, worker relevance, project or policy relevance, and suitability for publication.

5 FUNCTIONAL REFRAMING AND CASE SELECTION

Because the recurring themes described activities performed by a capability system, the report presents them as six core functions. Representative cases were selected for evidence strength, explanatory value, relevance to the framework, and ability to remain fully anonymous.

Figure 7 shows how the study moved from individual evidence sources to the report-facing framework of six core functions.

From Evidence Sources to Six Core Functions

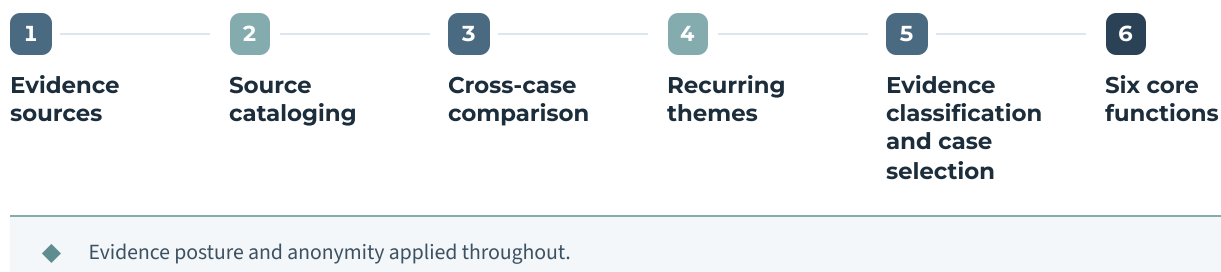


Figure 7. From Evidence Sources to Six Core Functions. The research team cataloged and compared evidence across cases, identified recurring themes, classified the evidentiary basis of proposed findings, and selected representative cases. The recurring activities are presented as six core functions because they describe what an employer-embedded workforce capability system does.

The figure should be read as a structured qualitative synthesis, not a statistical or causal model. The six functions organize recurring evidence without implying that every employer uses the same program design or sequence.

How to Read the Evidence

The report uses five primary evidence categories to help readers understand the basis of each finding and case.

Table 2. Evidence Categories Used in the Report.

Evidence category	Meaning
Directly Observed	Training environments, simulated work, project observations, and other practices observed by the research team.
Company-Record Evidence	Training, qualification, assessment, attendance, retention, or process records supplied by a participating organization.
Participant-Reported Practice	Practices, investments, experiences, and operating descriptions provided through interviews and field discussions.
Researcher Synthesis	Cross-case frameworks, conceptual models, practical interpretations, and recommendations developed by the research team.

HOW EVIDENCE WILL BE LABELED IN CASES

DIRECTLY OBSERVED

COMPANY-RECORD EVIDENCE

PARTICIPANT-REPORTED PRACTICE

PARTICIPANT PERSPECTIVE, PARAPHRASED

RESEARCHER SYNTHESIS

These categories allow the report to combine direct observation, records, participant experience, and cross-case interpretation while showing readers where each type of evidence originated.

Anonymity and Case Treatment

Complete anonymity is a governing condition of this report. The published report uses broad descriptors such as national industrial contractor, regional specialty contractor, self-performing general contractor, field leader, instructor, or craft professional. It does not publish company names, program brands, cities, states, regions, worker names, or identifiable facility details.

Distinctive numbers are rounded where appropriate. Unusual combinations of trade, location, program structure, institution, and exact numerical detail are separated so that individual organizations and participants cannot be identified.

Quotations are generally paraphrased unless exact language is needed and approved for publication. The research team retains a private source database for internal auditability.



SECTION 4

Findings: How Employer-Embedded Workforce Capability Systems Work

The structured synthesis identified six recurring core functions in the employer-embedded workforce capability systems documented in the participating sample.

Contractors combined and organized these functions in different ways. Some operated major training facilities. Others relied on modest spaces, field instructors, digital systems, external partnerships, or distributed networks of experienced practitioners. Across those different forms, the same broad functions appeared repeatedly:

- 1 Govern and invest in capability.
- 2 Recruit and prepare workers for entry.
- 3 Develop capability through blended learning.
- 4 Assess, document, and maintain readiness.
- 5 Deploy capability for project-specific needs.
- 6 Convert capability into careers, leadership, and workforce continuity.

Figure 8 presents the six functions as connected parts of one operating system.

Six Core Functions of Employer-Embedded Workforce Capability Systems



Figure 8. Six Core Functions of Employer-Embedded Workforce Capability Systems. The six functions operate as connected parts of one system through which employers build, verify, apply, refresh, and sustain workforce capability. The functions reinforce one another, linking organizational investment and worker entry to development, readiness, project use, careers, leadership, and continuity.

The functions are connected rather than independent programs. Organizational investment supports the full system. Recruitment brings workers into a development pathway. Blended learning builds capability. Assessment and documentation establish readiness. Deployment connects capability to project work. Career progression and leadership return knowledge and experience to the system.

CENTRAL FINDING

The system works because the functions reinforce one another.

Govern and Invest in Capability

The documented employer capability systems functioned as organizational infrastructure connecting learning, assessment, records, project needs, and advancement.

CORE FUNCTION 1	WHAT THIS FUNCTION DOES Govern and Invest in Capability The employer makes capability development part of how the organization operates by assigning responsibility, sustaining learning resources, investing in instructors and learning environments, connecting development to field needs, and preserving knowledge over time.
--	--

The Anatomy of a Capability System

The organizational form varied, but several underlying components recurred across cases.

Responsibility was assigned to workforce-development leaders, training directors, coordinators, craft-training supervisors, superintendents, foremen, and experienced field practitioners. These workers and leaders identified needs, organized learning, prepared instructors and coaches, maintained records, and connected development to the work ahead.

The systems also connected partnerships, curricula, learning environments, assessment, records, project planning, and career mechanisms. **Figure 9** organizes those elements around the central function of employer orchestration.

Anatomy of a Capability System



THROUGHOUT Sustained investment, accountability, and continuous improvement

Figure 9. Anatomy of a Capability System. Employer orchestration connects people, partnerships, learning resources, assessment, records, project needs, and career mechanisms into one operating system. The figure emphasizes the consistency with which these components are connected and used across the organization.

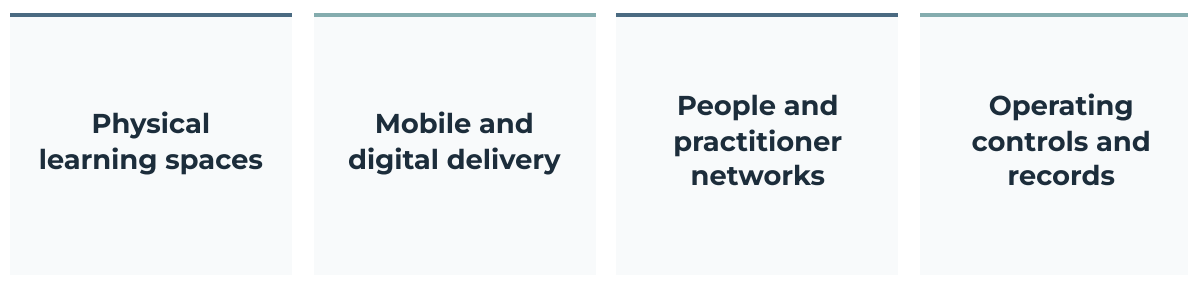
Employer orchestration is the central term because the employer does not need to own every component. Its distinctive role is to connect the pieces to company standards, project demand, worker assignments, and career pathways.

Capability Infrastructure Takes Many Forms

Capability infrastructure appeared in many forms across the study. Some employers operated staffed institutes. Others used training rooms, fabrication shops, mock-up spaces, equipment-practice areas, mobile classrooms, live virtual instruction, digital libraries, and jobsite instructors.

Figure 10 groups the documented infrastructure into four forms that can be combined at different scales.

Capability Infrastructure Takes Many Forms



Sophistication is not square footage.

Figure 10. Capability Infrastructure Takes Many Forms. Established capability systems may operate through major facilities, modest spaces, distributed practitioner networks, mobile or digital delivery, and strong operating controls. The relevant measure of sophistication is not square footage, but the consistency with which capability is developed, verified, documented, refreshed, and applied.

REAL EXAMPLE FROM THE STUDY

An Institute at Scale

A national industrial contractor described a staffed institute that supported skilled-trade development, safety preparation, supervisory development, leadership, and advanced leadership. In a typical year, the institute reportedly served about 1,000 unique workers across roughly 2,000 course seats because many workers participated in more than one form of development. The same system included simulated utility, substation, and welding environments.

NATIONAL INDUSTRIAL CONTRACTOR

PARTICIPANT-REPORTED PRACTICE

The example illustrates institutional scale, but scale was not the defining characteristic of maturity. Several well-organized systems operated through smaller spaces supported by recurring schedules, practitioner instructors, assessment practices, usable records, and strong field connections.

What Sustained Employer Commitment Looks Like

Sustained commitment becomes visible through recurring practices. Employers described formal calendars, recurring sessions, paid instructor preparation, paid worker participation, reusable internal content, dedicated coordinators, and regular updates to training materials. **Figure 11** summarizes the practices that turn development from an occasional event into an expected part of the organization.

What Sustained Employer Commitment Looks Like

Dedicated responsibility	Recurring calendar	Paid instructor preparation
Paid worker participation	Reusable and updated content	Connection to work and advancement

Figure 11. What Sustained Employer Commitment Looks Like. Sustained commitment is visible when capability development has dedicated responsibility, recurring time, paid preparation and participation, reusable content, and a clear connection to field work and advancement. These practices signal that learning is treated as part of the employer operating model rather than as an occasional extra activity.

At one regional mechanical contractor, superintendents identified training needs and selected foremen to develop and teach classes. The employer paid the foremen to prepare the material and paid workers to attend sessions held after normal work hours. The investment communicated that teaching and learning were both valued forms of work.

Visible investment also shaped how participants described the employer brand. A company that prepares instructors, pays workers to learn, and maintains a recurring program communicates that it is investing in workers rather than only filling current positions.

Organizational Continuity Through Shared Knowledge

Capability systems also preserve knowledge. Experienced practitioners hold detailed understanding of tools, sequences, project conditions, quality expectations, common mistakes, and effective ways to explain the work. When that knowledge remains with one person, the organization risks losing it as workers retire, change roles, or leave.

Several employers were converting practitioner knowledge into reusable organizational resources. Foremen and superintendents developed classes, updated presentations, prepared demonstrations, created checklists, and added material to growing digital libraries. The content could then be reused, refined, and passed to future instructors and workers.

This creates a self-renewing cycle. Field experience becomes learning content. Learning content supports the next group of workers. Those workers later return as coaches, instructors, assessors, and leaders. Sustained investment gives workers greater access to learning, visible evidence of employer commitment, and a stronger foundation for long-term career planning.

Recruit and Prepare Workers for Entry

The employers documented in this study were not only consumers of the workforce pipeline. They were actively creating, expanding, and stabilizing it.

CORE FUNCTION 2	WHAT THIS FUNCTION DOES Recruit and Prepare Workers for Entry The employer builds earlier pathways into construction and prepares new workers before field placement by connecting career exposure, recruiting, entry expectations, basic skills, jobsite logistics, peer relationships, and coaching support.
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Employers as Pipeline Builders

Many contractors face the same recurring challenge: project demand requires qualified workers, but the traditional pipeline does not always produce enough workers with the right preparation at the right time.

Participating employers responded by moving further upstream. Some created full-time roles focused on high-school construction programs, community outreach, internships, and early career exposure. Others worked with schools and colleges to connect instruction with real employment opportunities.

One national electrical contractor described growing a high-school pathway from one school and a small first cohort into a multi-school network serving several hundred students. Students could begin industry preparation before graduation and see a structured route from school into apprenticeship and employment.

These efforts did more than advertise open positions. They began the capability-development process before a worker reached the first full-time assignment.

From Early Exposure to a Regional Talent Flywheel

One of the strongest partnership cases involved a self-performing general contractor and a community college. The employer provided instructors and tuition support, while the college provided classrooms, facilities, credit, and educational infrastructure. Workers could receive apprenticeship instruction, college credit, and recognized credentials through the same pathway.

The employer also invited other contractors to recruit from the program. That choice expanded opportunity for students and reduced the risk that the pathway would depend on the workload of one company.

Figure 12 shows how early exposure, education, credentials, employment, and multi-employer recruitment can reinforce one another.

From Early Exposure to a Regional Talent Flywheel



Figure 12. From Early Exposure to a Regional Talent Flywheel. Employer participation can connect career exposure, education, credit, credentials, employment, and multi-employer recruitment into a reinforcing regional pipeline. The model creates shared value by expanding worker opportunity, strengthening educational relevance, and increasing the number of qualified workers available to several employers.

The flywheel illustrates how one employer investment can support a wider regional pathway when education, credentials, employment, and multi-employer recruiting reinforce one another.

A national self-performing general contractor supplied instructors, supported worker tuition, and used a community college learning environment. The pathway connected apprenticeship progress with college credit and recognized credentials. By allowing several employers to recruit graduates, the partnership helped sustain placement and grow the regional talent pool beyond the needs of one contractor.

Prepared Together Before First Placement

Entry preparation was another recurring function. In this report, new entrants are workers beginning a construction career or entering a new craft with little or no field experience. They may include recent high-school or career and technical education participants, career changers, and other workers preparing for a first field assignment. One regional interiors contractor created a one- to two-week boot camp for workers with less than approximately six months of construction experience.

REAL EXAMPLE FROM THE STUDY

Prepared Together

The contractor brought a small cohort of workers with less than approximately six months of construction experience together before first placement. The boot camp introduced safety expectations, required PPE, tool belts, screw guns, basic framing and drywall activities, jobsite access, parking, work areas, daily routines, and what to expect on the first assignment. Workers also formed relationships with peers entering at a similar experience level. In some markets, instructors used what they learned about each entrant to support a more thoughtful coach match.

REGIONAL INTERIORS CONTRACTOR

PARTICIPANT-REPORTED PRACTICE

The preparation supported technical, logistical, and social readiness at the same time. It also reduced the amount of first-day orientation that field leaders had to provide while active work was underway.

Entry Points That Become Career Gateways

Several participants described a shift away from expecting new workers to learn primarily by watching others. In the more intentional systems documented in this study, instructors explained expectations, demonstrated the work, coached practice, and invited questions.

This approach welcomed entrants as future craft professionals. It also helped workers understand how an initial role could connect to technical capability, recognition, compensation, leadership, or movement into another part of the organization.

The strongest entry systems treated support roles and early assignments as starting points rather than permanent ceilings. Workers could see how preparation, practice, assessment, and experience formed a pathway forward.

Thoughtful entry preparation replaces uncertainty with readiness, relationships, and a visible path forward. It helps workers understand the work, the workplace, the expectations, and the opportunities beyond the first assignment.

“ VOICE FROM THE FIELD

Adult-to-Adult Teaching

Teenagers and workers in their early 20s told instructors that they wanted to be treated fully as adults. The contractor found this feedback valuable. Instructors had greater success when they spoke with new workers adult to adult, made clear that they were there to help them learn rather than simply issue orders, and paired high expectations with visible support.

National electrical and instrumentation contractor

PARTICIPANT PERSPECTIVE,
PARAPHRASED

Develop Capability Through Blended Learning

The strongest systems did not rely on one delivery modality to develop every form of capability.

CORE FUNCTION 3	WHAT THIS FUNCTION DOES Develop Capability Through Blended Learning The strongest systems intentionally combined structured instruction, coached practice, repetition, field experience, and simulated work. The blend was selected to match the capability being developed and to give workers multiple opportunities to understand, practice, apply, and refine it.
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Blended Training Modalities Support Effective Capability Development

Different learning environments serve different purposes. Structured instruction can explain principles, procedures, calculations, standards, and expectations. Demonstrations show how knowledge is applied. Coached repetition builds familiarity and control. Simulation allows mistakes and refinement before active work. Field experience exposes workers to real conditions, coordination, variability, and production expectations.

Figure 13 presents these modalities as an intentional blend rather than a fixed sequence.

Blended Training Modalities Support Capability Development



Figure 13. Blended Training Modalities Support Capability Development. Capability develops through repeated connections among understanding, practice, and application. The braided pathway shows how structured instruction, demonstration, coached repetition, simulation, field experience, feedback, and refresh reinforce one another across the learning journey.

The model also explains why course completion is not the endpoint. Capability grows as workers move repeatedly among understanding, practice, application, feedback, and refresh.

One national industrial contractor alternated concentrated learning and simulated practice with field application, bringing workers back for later stages of development. A national electrical and instrumentation contractor combined live virtual classes, jobsite instructors, mobile learning spaces, and on-demand content for a geographically dispersed workforce. The delivery models differed, but both employers intentionally combined multiple environments around the capability being developed.

Building on Strong Foundations with Employer-Specific Knowledge

Registered apprenticeship, association programs, industry curricula, colleges, high schools, and prior experience provided strong foundations. Participating employers then fine-tuned those foundations to the systems, standards, technologies, and production practices used within their own operations.

Employer-specific knowledge included company safety and quality expectations, labor and production planning, internal work processes, communication and documentation, technology and digital tools, validation and authorization procedures, coordination, culture, and leadership expectations.

- A regional mechanical contractor supported its learning system with several dedicated training staff, including a craft master trainer. Controls capability was important to the contractor work, so the employer created a complete learning plan and brought workers into the fabrication environment for hands-on instruction. The plan extended existing mechanical development pathways into a related operational capability.
- A regional interiors contractor built a competency-based pathway around metal-stud framing and drywall. The pathway supplemented broad trade knowledge with construction math, blueprint reading, layout, structured on-the-job development, and practical sign-offs covering safety, quality, and production. Workers progressed by demonstrating capability rather than by elapsed time alone.

These employers were not replacing established education. They were using it as a foundation and taking an additional step to fine-tune learning to specific operational needs. The result was a next-level approach that connected broad trade knowledge to the systems, standards, and work performed every day.

Practitioners as Instructors, Coaches, and Leaders

Experienced practitioners were central to capability development. Project managers, superintendents, foremen, owners, craft professionals, and field leaders taught because they understood how work is planned, performed, checked, coordinated, and improved.

The strongest systems also prepared the workers who coached and assessed others. **Figure 14** shows how practitioner-led instruction can develop the learner and the instructor at the same time.

When Practitioners Teach, Capability Grows Both Ways



Figure 14. When Practitioners Teach, Capability Grows Both Ways. Practitioner-led instruction transfers field knowledge to workers while strengthening the instructor's ability to explain, demonstrate, coach, and lead. The reciprocal model shows why several participating contractors treated teaching as both a workforce-development mechanism and an intentional form of leadership development.

A regional interiors contractor selected experienced workers and invited them to complete a coach-qualification program before they were paired with trainees. Coaching occurred during normal field work, and a trainee could learn from more than one coach across different projects. A separate regional craft certifier later observed the trainee and used a detailed checklist to evaluate work sequence, safety, quality, and production before confirming readiness.

At one regional mechanical contractor, superintendents identified training needs and selected foremen to develop and teach the corresponding classes. The employer paid foremen to prepare the material and paid workers to attend. Company leaders also noted that foremen regularly need to explain work to crews and clients. Teaching therefore transferred technical knowledge while giving foremen deliberate practice in communication, coaching, and leadership.

Several participating contractors treated practitioner-led instruction as a deliberate dual-purpose investment. It strengthened the learner and developed the instructor, allowing one activity to support technical continuity and future leadership at the same time.

Practice Before the Field

Some of the most developed learning environments allowed workers to practice real work before performing it under project conditions.

Figure 15 shows the range of environments that participating employers used to explain, practice, rehearse, coach, and apply capability.

Learning Environments Across the Capability System

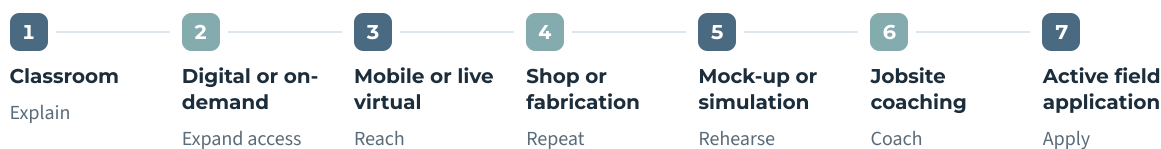


Figure 15. Learning Environments Across the Capability System. Capability can be developed across classroom, digital, mobile, shop, simulation, jobsite-coaching, and active-field environments. Each setting contributes a different part of learning, from explanation and access to repetition, rehearsal, coaching, and application under real project conditions.

The environments are complementary rather than interchangeable. Their value depends on matching explanation, practice, rehearsal, coaching, and field application to the capability being developed.

REAL EXAMPLE FROM THE STUDY

Rehearsing the Work Before the Work Begins

A national industrial contractor operated simulated utility, substation, and welding environments where workers could practice away from live project pressures. When an upcoming client scope differed from the contractor normal approach, the employer recreated the condition and brought in the actual team assigned to perform the work. The team rehearsed the activity and refined safety controls, quality expectations, work sequence, tools, responsibilities, and production approach before mobilization. The practice also allowed experienced workers to tune existing skills for the specific work ahead.

NATIONAL INDUSTRIAL CONTRACTOR

PARTICIPANT-REPORTED PRACTICE

In an employer-embedded capability system, learning can function as project preparation. The learning environment becomes a place where the workforce and the work plan are readied together.

Learning Wherever the Workforce Is

Employers with geographically distributed workforces were finding ways to bring learning closer to workers and projects. Participating systems used live virtual classes, jobsite instructors, mobile classrooms, digital libraries, on-demand content, multilingual instruction, bilingual coaches, and digital-skills support.

Safety was woven through technical instruction. Rather than treating safety as a separate topic added after the technical lesson, employers described hazard controls, procedures, and quality expectations as part of performing the work correctly.

Workers also helped shape the learning system. **Figure 16** shows how worker requests and field experience can influence future topics, delivery methods, and priorities.

Worker Voice Strengthens the Learning System

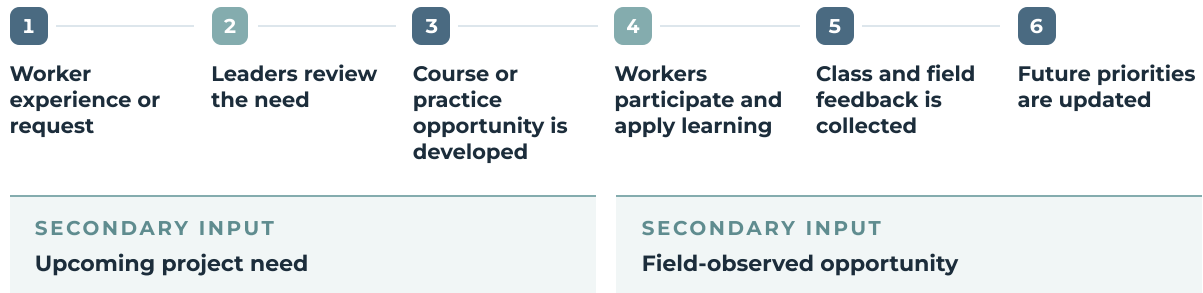


Figure 16. Worker Voice Strengthens the Learning System. Worker requests and field experience can inform future learning topics, delivery methods, and timing. The feedback loop allows workers to help shape the capability system while employers connect those requests to project needs, field observations, instructional capacity, and current workforce priorities.

The feedback loop positions worker voice as an input to system design while preserving the employer role in connecting requests to project needs, standards, and available instructional capacity.

At one regional mechanical contractor, every class ended with time for questions and suggestions for future topics. Some sessions were open to workers interested in learning beyond their primary work area. At another contractor, interest in selected cross-training events exceeded the instructional capacity and the number of workers that active projects could release. Together, the cases show worker voice as both an input to the system and a source of demand that the system must plan to accommodate.

Blended learning replaces figure-it-out-alone with instruction, practice, coaching, feedback, and multiple opportunities to succeed. It can support confidence, mastery, belonging, and greater agency in the direction of a career.

Assess, Document, and Maintain Readiness

Training becomes workforce capability only when readiness is demonstrated, confirmed, documented, and kept current.

CORE FUNCTION 4	WHAT THIS FUNCTION DOES Assess, Document, and Maintain Readiness The employer converts learning into verified capability by establishing task- and role-specific standards, giving workers opportunities to demonstrate performance, confirming readiness through qualified assessment, recording the evidence, authorizing work, and keeping capability current through renewal, review, and refresh.
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Instruction creates the opportunity to learn. Capability assurance determines whether that learning is ready for use. Across the evidence, assessment was connected to actual work rather than attendance alone. The standards varied by task, trade, equipment, risk, and responsibility, but the recurring elements were demonstrated performance, applicable safety understanding, quality expectations, current authorization, and documented status.

KEY DEFINITION — VERIFIED CAPABILITY Current, documented evidence that a worker can perform defined work to the required standard, with applicable safety understanding, demonstrated quality, appropriate authorization, and tracking of the corresponding credentials.
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One of the most developed cases translated readiness into a practical set of expectations for both craft workers and field leaders.



REAL EXAMPLE FROM THE STUDY

Verified Capability in Practice: Interior Framing

One regional interiors contractor used a competency-based process to determine journey-level readiness for interior framing. A worker developed the skill through employer-specific learning and structured on-the-job development with trained coaches. A trained regional craft certifier then observed that individual worker completing a representative body of work. Verification covered the technical sequence, required safety procedures, quality criteria for spacing, plumbness, levelness, and straightness, and a precise productive-performance target measured in linear feet per workday. The company tracked a specific target value, but the amount is intentionally not published. Taken together, the assessment provided a complete individual competency check across technical execution, safety, quality, and productive performance. Sign-offs and progress were recorded in the learning-management system, and field skills and competence were reviewed annually. The same contractor assessed field leaders through work planning, percent-complete reporting, job safety analyses, toolbox talks, workforce administration, and coordination with other trades.

REGIONAL INTERIORS CONTRACTOR

PARTICIPANT-REPORTED PRACTICE

The case shows how a capability system can make advancement expectations visible. Workers know what must be demonstrated, assessors know what evidence to examine, and the organization can connect achievement to recognition, assignment, and progression.

Assessing Capability at the Level of the Work

Capability assessment changes as responsibility changes. Craft assessment is most useful when it reflects the task itself, including technical sequence, required safety procedures, quality criteria, and productive performance. Field-leader assessment requires a broader view that includes planning, communication, reporting, coordination, workforce administration, and leadership behavior.

Figure 17 compares these two evidence profiles.

Assessing Craft Capability and Field Leadership

CRAFT CAPABILITY	FIELD LEADERSHIP
- Individual practical demonstration - Correct technical sequence - Required safety procedures - Quality criteria - A precise linear-feet-per-workday target	- Planning - Percent-complete reporting - Safety analyses - Toolbox talks - Workforce administration - Coordination - Superintendent observation
Assessed by a trained craft certifier, with the target value withheld.	

Figure 17. Assessing Craft Capability and Field Leadership. Capability evidence should match the responsibility being assessed. Craft readiness is demonstrated through technical execution, safe procedures, quality criteria, and productive performance, while field-leader readiness includes the planning, communication, coordination, safety leadership, and workforce administration needed to lead others.

The comparison explains why one universal assessment cannot represent every form of construction capability. The evidence must be specific enough to show that the worker or leader is ready for the actual responsibility ahead.

During an all-day brazing session at a regional mechanical contractor, workers repeatedly produced small practice or test joints, sometimes called coupons, while receiving coaching throughout the day. A quality leader on the shop floor evaluated whether each worker had followed the required procedures and produced acceptable work. Only after that internal readiness review was the final test piece sent for external testing and certification. The external test confirmed readiness after practice and coaching rather than serving as the worker's first evaluation.

This sequence made the assessment developmental as well as evaluative. Workers had repeated opportunities to build control and confidence before the final confirmation of readiness.

The Verified Capability Evidence Chain

The strongest systems did not treat one exam, credential, or supervisor opinion as the entire assurance process. They built evidence across learning, practice, demonstration, verification, authorization, use, and maintenance.

Figure 18 summarizes that evidence chain.

The Verified Capability Evidence Chain

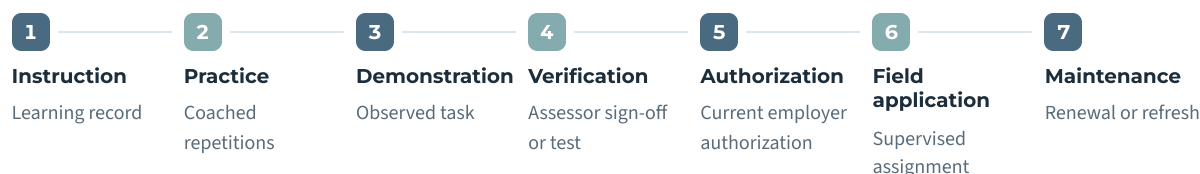


Figure 18. The Verified Capability Evidence Chain. The evidence chain follows capability from instruction through current field use. It distinguishes participation from demonstrated readiness and shows why authorization, supervised application, renewal, and refresh are part of capability assurance rather than administrative steps added after training.

The chain separates three questions that are often collapsed. What has the worker learned? What has the worker demonstrated? Is the capability current and appropriate for the assignment now? A reliable system provides evidence for all three.

A test or credential may confirm an important requirement, but readiness is built through the full chain of instruction, practice, demonstration, verification, authorization, field application, and maintenance.

Some work also requires licenses, external certifications, owner qualifications, or jurisdiction-specific steps. Those requirements can be incorporated into the evidence chain without reducing capability to a single universal test.

From Capability Records to Assignment Decisions

Capability records become valuable when they are current, accessible, and used in field decisions. Participating contractors described searchable certification systems and scannable worker records that allowed supervisors to confirm task and equipment qualifications before assigning work.

Figure 19 shows how records, project needs, and supervisor judgment come together.

From Capability Records to Assignment Decision

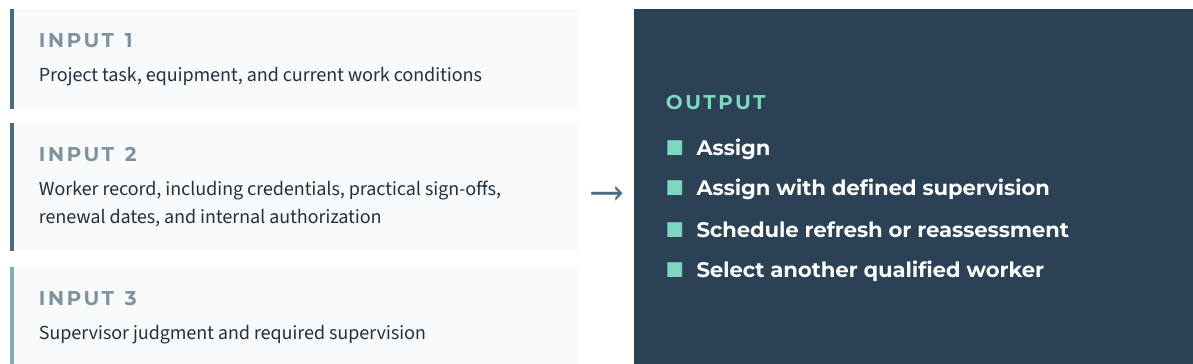


Figure 19. From Capability Records to Assignment Decision. Capability data become operating data when supervisors use current records together with the work requirement and professional judgment. The resulting decision connects verified readiness to assignment, supervision, refresh, or selection of another qualified worker.

Records do not replace field leadership. They give supervisors a stronger basis for deciding who is ready for what work, under which conditions, and for how long the authorization remains current.

A regional steel and precast contractor described a searchable system that allowed field leaders to review each worker's certifications and equipment authorizations by name before assigning equipment operation. A national heavy industrial contractor described worker identification cards that supervisors could scan to confirm current equipment and task qualifications before a worker entered the activity.

Keeping Capability Current and Visible

Capability can change as credentials expire, equipment changes, standards evolve, workers move into new roles, or time passes between assignments. Employers in the study used renewal dates, learning-system records, annual field reviews, more frequent reviews tied to progression, and targeted refresh to keep readiness current.

Maintenance also makes achievement visible. One regional contractor used recognition ceremonies to mark skill progression, while a national industrial contractor reported that employer-developed welders regularly earned top placements in a national craft competition. These examples show how capability can be recognized within the organization and beyond it.

Clear standards, coached practice, documented achievement, current credentials, and fair recognition help workers understand expectations, demonstrate what they can do, and progress with greater confidence.

Deploy Capability for Project-Specific Needs

Capability creates project value when the right worker is prepared, verified, and assigned to the right work at the right time.

CORE FUNCTION 5	WHAT THIS FUNCTION DOES Deploy Capability for Project-Specific Needs The employer connects project forecasts and work plans to worker capability by identifying required skills, selecting and preparing workers, confirming current readiness, making assignment decisions, providing appropriate supervision, and using feedback from the work.
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Development and assessment create potential. Deployment turns that potential into project readiness. Across the participating systems, the strongest connection appeared when project leaders used upcoming work to decide what capability was needed, who should be prepared, when training or refresh should occur, and how readiness would be confirmed before assignment.

Figure 20 presents this operating sequence.

From Work Forecast to Project Readiness



Figure 20. From Work Forecast to Project Readiness. Project readiness begins before mobilization when an employer connects expected work to required capability, worker selection, focused preparation, verification, assignment, supervision, and feedback. The process positions learning as part of workforce and production planning rather than as a separate calendar of classes.

The sequence also shows why deployment is not informal task switching. It is a deliberate decision that connects current evidence of capability to a defined project need.

Training Timed to the Work Ahead

Several employers timed learning to the work that workers were about to perform. At one regional mechanical contractor, superintendents could identify the workers assigned to an upcoming project involving a new system and schedule focused preparation before those workers arrived onsite.

A national electrical and instrumentation contractor used a similar logic across a geographically distributed workforce. Its jobsite training could begin with the activities that dominated the early phase of a project, such as conduit and cable-tray installation, and then shift as the work progressed.

A national electrical and instrumentation contractor combined live virtual instruction, jobsite trainers, mobile learning spaces, and online content. The learning sequence was matched to the work ahead. Early training emphasized the systems that workers would encounter first, and later instruction evolved with the next project phase. This approach brought learning to workers on active projects while keeping the content connected to current production needs.

Project-specific preparation can range from a focused class or refresh session to the actual-team rehearsal described in Section 4.3.4. In each form, the purpose is the same: prepare workers for the work, tools, sequence, standards, and team conditions they will encounter.

Capability Records as Operating Data

The records described in Core Function 4 become operating data when supervisors use them to staff work. A current credential, observed task sign-off, equipment authorization, renewal date, and known supervision requirement can all inform whether a worker is ready for a specific assignment.

A training record describes what occurred. Capability data help answer who is ready for which work, under what conditions, with what supervision, and until when.

Questions before a project-specific assignment:

- Is the required capability defined?
- Is the worker's evidence current and applicable to this task or equipment?
- Has project-specific preparation or refresh been completed?
- Is the authorization level clear?
- What supervision or field verification is required?
- How will feedback be documented and used after the work?

This information supports fairer and more consistent assignment decisions. Workers are selected based on demonstrated readiness rather than title, familiarity, or unsupported assumptions alone.

Readiness Built into Fabrication

Controlled fabrication settings provided another way to connect capability with project readiness. Workers could perform defined processes using organized workstations, digital drawings, controlled material flow, inspection points, and testing before assemblies reached the field.

REAL EXAMPLE FROM THE STUDY

Readiness Built into Fabrication

During a training-facility and fabrication visit, researchers observed a regional mechanical contractor producing modular copper assemblies in a controlled shop environment. Computerized cutting and digital workflow information supported precision. Completed assemblies were pressure-tested for a defined period, inspected, sealed, secured, and packaged before shipment. Workers, tools, quality checks, and material flow were organized around the requirements of the project before the assembly reached the site.

REGIONAL MECHANICAL CONTRACTOR

DIRECTLY OBSERVED

PARTICIPANT-REPORTED PRACTICE

A capability system can move practice, verification, quality checks, and work packaging upstream so that workers and assemblies arrive better prepared for field installation.

Projects and Capability Systems Improve One Another

Project demand shapes capability development, but the relationship also runs in the other direction. Developed capability affects how work can be staffed and sequenced. Field experience then provides new information about worker needs, project conditions, tools, standards, and future learning priorities.

Figure 21 presents this recurring feedback relationship.

Projects and Capability Systems Improve One Another

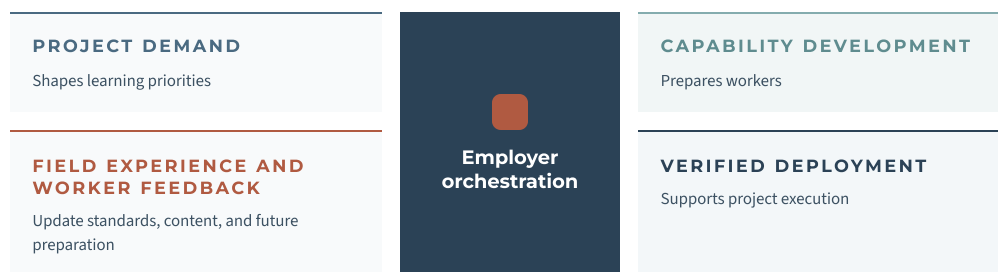


Figure 21. Projects and Capability Systems Improve One Another. Project demand informs what capability the employer develops, while verified capability shapes how workers are assigned and supported. Experience from the work then returns to the capability system, allowing future instruction, standards, preparation, and assignment decisions to improve.

The feedback loop is one of the clearest signs that the systems are operationally embedded. Training is influenced by real work, and real work becomes a source of learning for the next project and the next group of workers.

Project-specific preparation means arriving ready, knowing what is expected, and being assigned based on demonstrated capability. It can support confidence, safety awareness, fairness, and continuity as project needs change.

Convert Capability into Careers, Leadership, and Workforce Continuity

The endpoint is not course completion. It is the opportunity for a fulfilling career, meaningful contribution, and a more stable life.

CORE FUNCTION 6	WHAT THIS FUNCTION DOES Convert Capability into Careers, Leadership, and Workforce Continuity The employer connects demonstrated capability to deeper mastery, selected broader skills, additional responsibility, coaching, assessment, leadership, recognition, continued employment, and visible career pathways that sustain workers and the organization.
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Across the study, capability development was not only an input to project work. It was also a form of career architecture. Workers could see routes from entry to craft mastery, from mastery to coaching or leadership, and from one area of capability to another as interests, strengths, and work needs changed.

A capability system creates pathways and conditions through which workers can build mastery, choice, recognition, leadership, continuity, and meaningful contribution over time.

A Path Beyond the Entry Role

One of the strongest worker-centered cases showed how an employer connected an operational workforce need with a new career pathway.

A large national industrial contractor created a pathway through which workers in scaffolding, painting, and insulation could develop pipefitting capability. The employer needed more pipefitters and saw an opportunity to expand options for workers whose original roles could be physically demanding and offered fewer advancement routes. Training occurred on active sites, and workers could move into pipefitting as the project phase changed while retaining the ability to support their original work area when needed.

The case illustrates the dual-value logic of the report. The employer developed capability it needed, while workers gained an avenue toward greater mastery, continuity, and choice.

“ VOICE FROM THE FIELD

Workers Were Seeking the Opportunity

The contractor reported strong worker demand for access to the higher-skilled pathway. Leaders described the opportunity as a source of loyalty because workers could see the employer investing in a more durable future for them.

Large national industrial contractor

PARTICIPANT PERSPECTIVE,
PARAPHRASED

Breadth Often Follows Depth

Broader capability did not always begin on the first day. One regional mechanical contractor observed that apprentices were often focused on mastering their primary trade and were less likely to seek additional cross-training while already completing rigorous instruction. Interest in broader learning often increased after workers had established a strong technical foundation.

This depth-first pattern supports the report's broader position that capability systems complement specialization. The objective is not to maximize the number of skills held by every worker. It is to create meaningful options that fit the worker, the work, and the stage of the career.

One worker at a regional mechanical contractor entered through a plumbing pathway, later developed pipefitting and welding capability, moved into specialized process work, and occasionally supported adjacent work areas. The worker reported remaining continuously employed as project needs changed. The example shows how selected additional capability can support both mastery and continuity without eliminating a primary craft identity.

Another contractor emphasized that early exposure to several kinds of work can help younger workers discover their strengths and retain agency over the direction of their careers. Together, the cases show breadth as a choice built on capability, not as a requirement imposed without purpose.

Career Architecture Beyond Journey Level

A capability system can continue after a worker reaches journey level. The participating systems created pathways into deeper technical specialization, coaching, assessment, crew leadership, field leadership, instruction, advanced leadership, and, in some cases, ownership.

Figure 22 presents these pathways as a branching architecture rather than one required ladder.

Career Architecture Beyond Journey Level

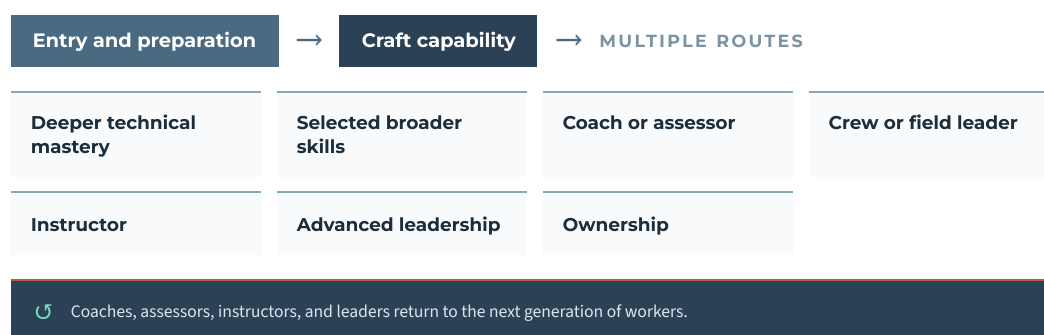


Figure 22. Career Architecture Beyond Journey Level. Capability systems can create several pathways beyond journey level, including deeper specialization, selected broader capability, coaching, assessment, instruction, field leadership, advanced leadership, and ownership. The branching form emphasizes worker choice and shows how experienced workers can return knowledge to the system.

The figure is intentionally not a single upward ladder. Some workers may pursue deeper craft mastery. Others may teach, assess, lead, or combine several responsibilities over time. A strong system makes the choices visible and connects each pathway to demonstrated capability.

A regional interiors contractor described a visible progression from entry boot camp to craft capability, coach qualification, crew leadership, field leadership, and advanced development. The employer reported that nearly all field leaders were developed internally. After reaching journey-level capability, many workers became coaches and helped develop the next group of entrants. Recognition ceremonies marked progression and made achievement visible across the organization.

At another contractor, a long-tenured worker described progressing from field craft work into labor leadership, general-superintendent responsibility, and an ownership role. The example illustrates the outer reach of career architecture when technical credibility, leadership, and organizational opportunity remain connected.

“ VOICE FROM THE FIELD

Giving Back Becomes Part of the Career

Workers who reached craft capability could return as coaches, helping another worker progress through the same system. Participants described this as a meaningful way to lead, contribute, and give back.

Regional interiors contractor

PARTICIPANT PERSPECTIVE, PARAPHRASED



Training Participation and the Retention Association

One participating employer provided unusually large company-record evidence about the relationship between development participation and workforce continuity.

COMPANY-RECORD EVIDENCE

Training Participation and Workforce Retention

A regional interiors contractor linked approximately 60,000 craft and field-leader training records with more than 20,000 hire records. The company classified workers as participating in development when they had completed at least one craft or field-leader offering or had enrolled in a structured on-the-job specialization. Safety-only orientations were excluded from the comparison. The analysis found a strong association between development participation and remaining employed over longer periods.

REGIONAL INTERIORS CONTRACTOR

COMPANY-RECORD EVIDENCE

Figure 23 summarizes the retention pattern reported in the company analysis.

Training Participation and the Retention Association

2x

At two years

3x

At three to four years

5x

At five years

10x

At ten or more years

COMPANY-RECORD EVIDENCE

Association, not causation.

Figure 23. Training Participation and the Retention Association. In one company's longitudinal record analysis, workers who participated in craft or field-leader development were about twice as likely to remain at two years, three times as likely at three to four years, five times as likely at five years, and ten times as likely at ten or more years. The pattern is an association from company records, not a causal estimate.

The analysis does not isolate why the difference emerged. Worker motivation, advancement, supervisor support, project opportunity, and employment conditions may all contribute. Even with that boundary, the scale and consistency of the pattern make this one of the report's most important examples of workforce continuity associated with capability development.

Choices, Family, and Workforce Continuity

Participants described career value in terms that extended beyond titles. They spoke about choice, pride, belonging, the ability to stay with a crew or employer, continued work as project needs changed, and the responsibility of supporting a family.

Another specialty contractor described a family-first atmosphere and linked employer-led development to staying in the trade, remaining with the crew, and building proficiency more quickly. These perspectives were not measured as household outcomes, but they show how workers and employers understood the broader meaning of continuity.

The worker-facing culmination of the capability system is therefore not one prescribed destination. It is a broader set of choices: deeper mastery, selected additional skills, leadership, teaching, steadier work, recognition, and the opportunity to make a meaningful contribution.

Capability can open choices, including deeper mastery, selected broader skills, leadership, teaching, steadier work, recognition, and meaningful contribution. These pathways may support agency, belonging, family stability, purpose, and dignity over the course of a career.

Taken together, the six core functions show how capability becomes an operating and human system. Employers invest and organize, bring workers into the field, develop capability, verify and maintain readiness, connect it to project needs, and convert it into careers, leadership, and continuity. Section 5 discusses what this complete system means for workers, employers, projects, owners, and public policy.

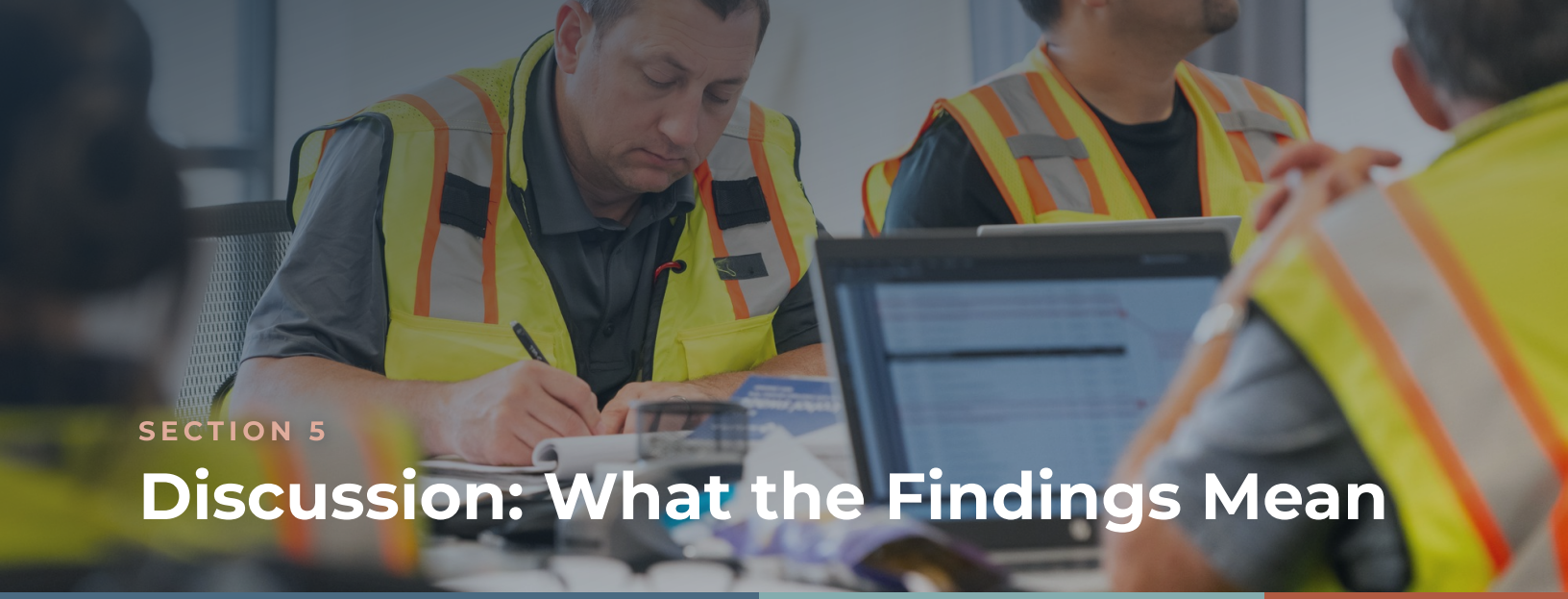
“ VOICE FROM THE FIELD

A Career That Supports a Family

One regional mechanical contractor described going to extraordinary lengths to keep strong workers busy and able to provide for their families. The employer’s message was that construction should be understood as a career, not simply a short-term job, and that continued learning is part of building that career.

Regional mechanical contractor

PARTICIPANT PERSPECTIVE,
PARAPHRASED



SECTION 5

Discussion: What the Findings Mean

The six core functions show that workforce capability is created through an operating system. Employers organize responsibility, bring workers into the field, blend formal and experiential learning, verify readiness, connect capability to project needs, and convert experience into careers, leadership, and continuity.

The broader meaning of those findings is equally important. A capability system links learning to actual work. It gives employers a way to determine what workers are ready to do, gives workers a clearer path for growth, and gives project leaders a stronger basis for assignment and supervision. It also reveals why safety, quality, productive performance, multiskilling, and worker value belong in the same discussion.

This study also changes the unit of analysis. Construction employers functioned as learning organizations within their operating organizations. They selected and adapted curricula, prepared instructors and coaches, created practice environments, assessed performance, maintained records, and used the resulting capability in project and career decisions.

The central question is how learning becomes current, demonstrated, documented, assignable, and connected to advancement. The following discussion interprets the six functions through that capability lens.

Section 4 documented six recurring functions and grounded them in real contractor practices. Section 5 interprets the system-level meaning: capability assurance integrates technical proficiency, safe execution, quality workmanship, and productive performance; verified capability provides the foundation for multiskilling; worker value extends into security, mastery, agency, belonging, leadership, and career sustainability; and capability measurement follows learning into work.

Capability Assurance Integrates Safety, Quality, and Productive Performance

Employer-embedded workforce capability systems can integrate safety, quality, and productive performance into how workers are developed, assessed, documented, and assigned. Technical proficiency is at the center of the standard. Readiness includes understanding and performing the task, using the required safety practices, producing work that meets defined quality criteria, and performing at the productive level expected for the role.

This integrated approach can be described as capability assurance. Capability assurance is the organizational process through which an employer develops and maintains credible evidence that a worker is ready for defined work. It connects standards, instruction, coached practice, demonstration, verification, records, assignment, supervision, and review.

Safety is integrated throughout the sequence. Hazards are taught with the work, safe procedures are practiced while the skill is being developed, and safe execution is verified as part of the task. Quality follows the same pattern through workmanship standards, tolerances, inspection points, testing, and observed acceptance. Productive performance provides evidence that the worker can apply the skill at the level required for field use.

Figure 24 shows the full performance standard and the assurance chain that supports it.

Capability Assurance Integrates Safety, Quality, and Productive Performance

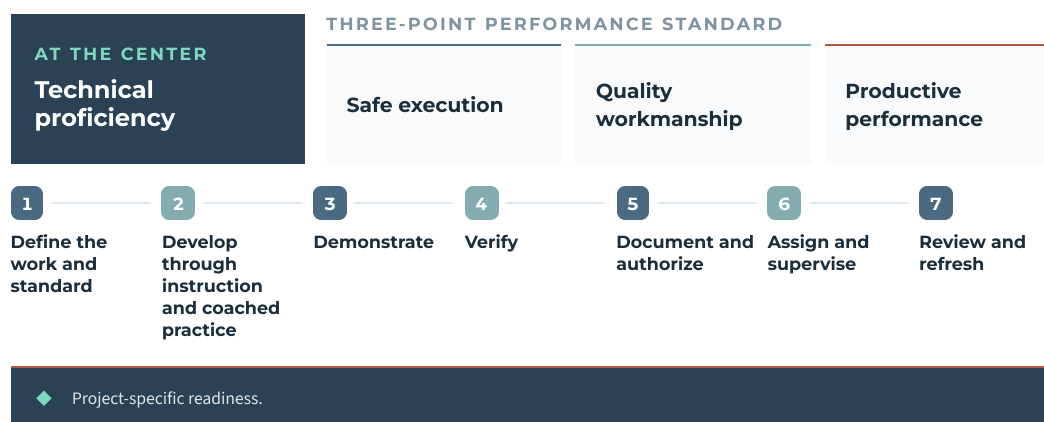


Figure 24. Capability Assurance Integrates Safety, Quality, and Productive Performance. Technical proficiency becomes usable field capability when the worker can execute the task safely, meet defined quality standards, and perform at the expected productive level. The assurance chain connects development, verification, documentation, assignment, and ongoing review so the full performance standard remains visible from learning through field use.

The figure places safety, quality, and production inside the definition of readiness. The same development and verification process carries all three from instruction through field assignment, giving workers, coaches, certifiers, and field leaders a common standard for performance.

- At one regional mechanical contractor, every apprenticeship class began with safety. When workers learned adjacent technical topics, the instruction also covered the hazards and controls most relevant to that work, including energy isolation, electrical exposure, falls, ladders, and burns. Safety knowledge was taught as part of performing the task.
- At one national industrial contractor, unusual work was recreated in a mock environment and the actual project team rehearsed it before mobilization. The team worked through safety controls, quality expectations, sequence, tools, responsibilities, and production. The learning environment allowed the team to align the full work plan before performing the scope live.
- One especially developed assessment model made the integration visible at the individual-worker and individual-task level. The regional interiors contractor described in Section 4.4 verified journey-level interior framing through observed technical execution, required safety procedures, quality criteria covering spacing, plumbness, levelness, and straightness, and a precise productive-performance target measured in linear feet per workday. A trained regional craft certifier observed the individual worker against the complete standard before journey-level readiness was confirmed.
- Other cases showed the same logic in different forms. During an all-day brazing session, workers practiced repeatedly, received coaching, and were reviewed by a quality leader before the final test piece was sent for external testing. In a controlled fabrication setting, workers used digital information, pressure testing, inspection, sealing, and secured packaging before assemblies were shipped to the field. In both examples, quality assurance began during development and preparation.

Controlled learning environments added another layer of assurance. Mock-ups, fabrication settings, equipment-practice areas, and project rehearsals allowed workers and leaders to test sequence, access, tools, inspection points, and team responsibilities before field execution. These settings created a place to correct misunderstandings while the work was still being prepared.

Records and assignment controls carry verified capability to the field. Searchable qualifications, scannable credentials, observed sign-offs, renewal dates, and worker experience records can create a traceable line from development to assignment. Field leaders and supervisors can use that evidence to confirm which workers are currently qualified to perform specific tasks, apply technical skills, or operate equipment, along with any required authorization or supervision.

These systems also create worker value. A worker who has practiced the task, understands the hazards and quality standard, knows the expected productive level, and can see the boundaries of current authorization enters the work with greater clarity. That clarity can strengthen personal confidence and trust within the crew because readiness is visible to the worker and the field leader.

Safety and quality are capability-assurance mechanisms. They define what ready means, and productive performance shows that the capability can be used effectively in the operating environment. Together, they turn workforce development into field-ready technical capability.

Multiskilling Is Built on Verified Capability

The central interpretation for the broader multiskilling research series is straightforward: capability is the foundation upon which multiskilling is built. Multiskilling has operating value only when a worker is competent, current, and authorized for the work being assigned. Documented cases showed employers tracking worker capability, work requirements, and where verified capability could be responsibly applied. In those cases, multiskilling was described as following training, qualification, and records showing that the worker was ready for the work being performed.

This framing also shows why specialization and multiskilling are not opposites. Both are applications of capability. An employer may deepen a worker's primary craft, add an adjacent skill, qualify the worker on equipment, prepare the worker for controlled fabrication, develop leadership capability, or combine several of these pathways over time. The purpose is not to maximize the number of tasks held by every worker. The purpose is to create useful, verified options that fit the worker, the work, and the stage of the career.

Prior research likewise treats multiskilling as a selective workforce strategy whose usefulness depends on skill combinations, labor demand, project constraints, and the way workers are assigned, rather than on full cross-training of the workforce (Gomar et al., 2002; Ahmadian Fard Fini et al., 2016b; Nasirian et al., 2022).

Recent studies examining competency and certification among multiskilled craft professionals further reinforce the distinction between possessing additional credentials and demonstrating the capability required for the work (Albalawi et al., 2023, 2024).

The findings repeatedly showed that breadth often follows depth. Workers who were still mastering a primary trade were commonly focused on that foundation. Interest in broader learning could increase after technical credibility and confidence had been established. Other employers used early exposure to several kinds of work to help new entrants discover strengths and make informed choices. Both patterns begin with intentional development and clear readiness expectations.

Figure 25 presents verified capability as the foundation beneath several responsible applications.

Building Multiskilling on Verified Capability

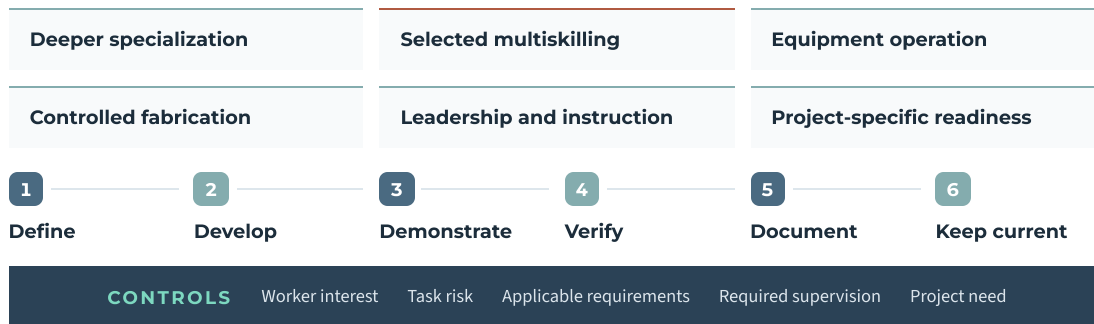


Figure 25. Building Multiskilling on Verified Capability. Employers first define, develop, demonstrate, verify, document, and maintain capability. They can then apply that verified capability through deeper specialization, selected multiskilling, equipment operation, fabrication, leadership, or project-specific readiness. The sequence keeps multiskilling connected to worker readiness, task requirements, supervision, and project need.

The figure reinforces two important ideas at once. First, multiskilling is a verified application of capability. Second, specialization remains valuable. Some workers create the greatest value through deep mastery, while others combine depth with selected breadth or move into equipment operation, fabrication, leadership, or instruction.

The purpose is to expand useful options, not to maximize the number of tasks assigned to every worker. The worker's interests, the risk and technical demands of the task, applicable requirements, available supervision, and project need shape where broader capability is used.

Following one capability from definition to current readiness — regional interiors contractor, participant-reported practice:

DEFINE	Interior framing was described through specific technical requirements, required safety procedures, quality criteria, and a precise productive-performance target measured in linear feet per workday. The target value is not published.
DEVELOP	Workers could complete employer-specific construction math, blueprint, layout, and specialization learning, then build the skill through structured on-the-job development with a trained coach.
DEMONSTRATE	The worker performed representative interior-framing work in the field.
VERIFY	A trained regional craft certifier observed the individual worker against the complete technical, safety, quality, and productive-performance standard before readiness was confirmed.
DOCUMENT	Sign-offs and progress were recorded in the employer learning-management system.
KEEP CURRENT	Field skills and competence were reviewed annually, with additional reviews used as workers progressed.

The example shows that multitasking grows from visible, maintained capability. The same evidence chain can be applied when an interiors worker adds another specialization, when an operator qualifies on another machine, or when a craft professional prepares for a new project scope. The additional assignment is connected to a defined standard and a current record of readiness.

This sequence matters for interpreting the companion reports. Those reports examine selected crew, workflow, staffing, schedule, and safety contexts that qualified multitasking may enable. This report supplies the organizational foundation by showing how employers develop and assure capability before deployment decisions are made.

KEY INTERPRETATION

Capability Is the Foundation. Multitasking Is a Verified Application.

Employer-embedded capability systems define the work, develop the worker, verify performance, document readiness, and keep the evidence current. Multitasking becomes an operating option when that verified capability is matched to a worker, a task, a project need, and the required supervision.

The Whole-Person Value of Capability

Capability systems can create value for workers through what they make possible across a career and the worker's broader fulfillment in their personal and professional life. Participants described potential value through economic security, mastery, agency, belonging, leadership, physical career sustainability, family responsibility, and contribution to the wider community. These dimensions may reinforce one another. A worker who sees a pathway, understands the standard, receives coaching, demonstrates growth, and is trusted with greater responsibility can experience development as both a career opportunity and a form of personal recognition.

Prior worker research identified higher pay, interest in another trade, continuous employment, learning, and career opportunity as important reasons workers considered additional skills, while direct evidence of long-term continuity remained limited (Carley et al., 2003; Castañeda et al., 2005; Wang et al., 2009).

Continuity, Hours, and Family

Construction work changes by project, phase, season, and market. Participants repeatedly valued the ability to remain useful as one activity ended and another began, transfer within the organization, and continue working across changing needs. Broader verified capability can allow a worker to remain with the same project through more phases, move to another assignment within the employer, and accumulate more working hours across the year.

That continuity has value beyond the jobsite. Steadier work can support household planning and the responsibility of providing for a family. Employers described keeping strong workers busy as part of their responsibility to the workforce, while workers and leaders spoke about construction as a career rather than a sequence of short-term jobs.

A national industrial contractor described workers moving into another qualified area as one trade scope wound down and another ramped up. The worker could remain useful to the project and continue working with the employer as the work changed. The value was both operational continuity and the opportunity to earn more hours through changing project phases.

One regional mechanical contractor described going to extraordinary lengths to keep strong workers busy and able to provide for their families. The employer's message was that construction should be understood as a career and that continued learning is part of building that career.

Mastery, Choice, and Belonging

Mastery and pride can be supported when growth is visible. Practical assessments, task sign-offs, credentials, recognition events, and progression standards give workers evidence that their skill has advanced. These mechanisms can strengthen pride in workmanship because the worker knows what was expected, what was demonstrated, and what opportunity the achievement now supports.

Agency is the ability to make meaningful choices. Workers in the documented systems could request training, deepen a specialty, pursue an adjacent skill, move toward coaching or leadership, or change direction as interests and opportunities evolved. A capability system creates value when it expands those choices rather than prescribing one destination for every worker.

Belonging can grow through relationships. Entry cohorts, coach matching, repeated mentorship, same-crew continuity, and recognition ceremonies created opportunities for workers to learn with people who knew their progress. These features made the capability system a social system as well as an instructional one. The worker was becoming part of a crew, a craft community, and an organization.

Leadership, Purpose, and Career Sustainability

Leadership and purpose extend advancement beyond status. Workers who became coaches, instructors, assessors, field leaders, superintendents, or owners gained opportunities to guide others and preserve hard-earned knowledge. In this form, advancement becomes a contribution to the next worker and to the continuity of the organization.

Physical career sustainability adds a longer time horizon. Construction careers place different demands on the body at different stages of life. Pathways into another technical area, planning, coaching, assessment, instruction, or leadership can create options as a worker's interests, strengths, and physical needs change. Capability development can therefore support a career that evolves over time.

A large national industrial contractor created a pathway for scaffold builders, painters, and insulators to develop pipefitting capability. The employer described the program as a way to give workers access to another technical area, remain useful as project phases changed, and continue working on the same site. Workers could train on site, move into pipefitting as the need developed, and later apply their earlier capability again when the project required it. The contractor reported strong worker interest in the pathway.

The same leadership and career pathways extend value beyond the individual worker. Experienced workers who teach, coach, and assess create the next generation of craft capability. High-school and college partnerships expand entry points for local students. Workers who build durable careers support families, crews, employers, projects, and the communities in which the work is performed.

Taken together, these dimensions support a whole-person lens on capability. The system may support steadier work, visible mastery, meaningful choice, social connection, opportunities to lead, and a career that can adapt across a working life.

“ VOICE FROM THE FIELD

Workers Asked for More

At one regional mechanical contractor, workers regularly suggested future learning topics and asked to attend training beyond their primary trade. Another instructor described limiting enrollment in some cross-training events because worker interest exceeded the available training capacity and the number of workers who could be released from projects.

Two regional contractors

PARTICIPANT PERSPECTIVE,
PARAPHRASED

From Training Measures to Capability Measures

One of the most important implications of the findings is a shift in measurement. A practical extension is to measure the capability outputs produced by the development system: technical proficiency, safe execution, quality workmanship, productive performance, current credentials, and readiness for assignment.

Enrollment, instructional hours, attendance, completion, and credentials remain valuable measures of participation and achievement. A capability framework adds the next level by connecting those records to what a worker can demonstrate, what a crew can cover, what a field leader can lead, what a project requires, and how consistently the organization maintains the system.

Capability measurement therefore follows learning into work. It establishes a visible line from development activity to verified performance and operating readiness. **Figure 26** organizes that measurement at five levels.

From Training Measures to Capability Measures



Figure 26. From Training Measures to Capability Measures. Participation and achievement records remain essential parts of the system. The capability framework connects those records to five operating levels: worker, crew, field leader, project, and organization. At each level, the central question is whether technical, safety, quality, and productive-performance requirements are visible, verified, current, and ready for use.

Credentials remain central to this framework because they record important achievements and required qualifications. Employer records extend their field value by linking credentials with observed sign-offs, current authorization, project-specific preparation, and experience. The result is a capability record that can guide worker progression and project assignment.

- At the worker level, the core measures are demonstrated technical proficiency, safe execution, quality workmanship, productive performance, and current credentials or authorizations. Together, these measures show what the worker can do and the standard at which the work can be performed.
- At the crew level, measures show whether combined capabilities cover the planned work, whether the needed supervision is present, and whether the crew is ready for the sequence ahead.
- At the field-leader level, measures include planning, coordination, progress reporting, safety and quality leadership, workforce administration, communication, and the ability to develop others.
- At the project level, measures connect the work forecast to required capability, identified gaps, focused preparation, actual-team rehearsal where needed, assignment fit, supervision, and feedback from execution.
- At the organization level, measures show whether governance, learning access, prepared coaches and assessors, consistent standards, current records, deployment controls, career pathways, and feedback operate as a connected system.

These measures create value for every major audience. Workers gain clearer standards and advancement signals. Employers gain better workforce and succession information. Owners gain a stronger basis for asking how project readiness is confirmed. Policymakers gain an outcome-oriented way to recognize multiple legitimate pathways that produce verified capability.

Integrated Meaning and Relationship to the Research Series

Taken together, the findings describe a construction employer as both an operating organization and a learning organization. Employer orchestration connects people, partnerships, curricula, instructors, coaches, learning environments, assessment, records, project demand, and career mechanisms into one capability system.

The learning organization is embedded within the operating organization. Project needs shape development priorities. Instruction and coached practice build capability. Assessment and records establish readiness. Assignment converts capability into work. Field experience updates future standards and content. Career progression turns experienced workers into coaches, assessors, instructors, and leaders who sustain the next cycle.

Capability assurance is the bridge that makes this cycle operational. It connects technical proficiency, safe execution, quality workmanship, and productive performance to current records and project assignment. It also provides the foundation on which specialization, multiskilling, equipment operation, fabrication, leadership, and project-specific readiness can be built.

This is the connection between the two forms of capacity introduced earlier in the report. The same system can build worker capacity through mastery, agency, continuity, leadership, and meaningful contribution while also building employer, project, and public delivery capacity. The value is shared because the worker's growth becomes part of the organization's ability to perform needed work.

This report fills a distinct role in the Multiskilling Research Series. It explains how capability is developed, verified, maintained, deployed, and advanced. Companion reports examine selected crew, workflow, staffing, schedule, and safety contexts that qualified multiskilling may enable.

The sequence should be read in that order. Capability is developed and assured first. Verified capability supports responsible deployment choices second. Worker, crew, project, owner, and public outcomes can then be evaluated in relation to those choices and the conditions in which they are applied.

Employer-embedded capability systems connect development and work. They build and verify readiness, apply it to project needs, renew it through experience, and convert it into careers, leadership, continuity, and delivery capacity. Multiskilling is one verified application of that larger system.

The framework therefore extends beyond multiskilling. It also explains deep specialization, equipment qualification, fabrication readiness, field leadership, project-specific preparation, and career progression. Its central contribution is to show the organizational system through which construction employers turn learning into capability and capability into opportunity and operating capacity.

Section 6 translates this integrated meaning into practical implications for contractors, workers, owners, policymakers, and taxpayers.





SECTION 6

Practical Implications

The findings point to a practical principle: workforce capability creates the greatest value when it is organized as part of operations, verified against defined work, connected to project needs, and connected to worker growth.

The six core functions provide a usable lens for action. They help an organization examine whether responsibility, entry, learning, assessment, records, assignment, advancement, and feedback reinforce one another. The same lens helps workers, owners, policymakers, and taxpayers recognize what a capability-centered system looks like and why it matters.

Five practical principles carry across all audiences.

Prior implementation research similarly emphasizes that management support, worker acceptance, training, skill assessment, compensation, and workforce planning influence whether broader capability can be used effectively (Haas et al., 2001; Shang et al., 2020).

1 ORGANIZE THE SYSTEM

Assign responsibility, sustain resources, and connect partners, instructors, coaches, records, projects, and careers.

2 DEFINE CAPABILITY

State the technical, safety, quality, and productive-performance standard for the work and role.

3 DEVELOP AND VERIFY

Combine instruction, coached practice, demonstration, assessment, documentation, and current authorization.

4 CONNECT CAPABILITY TO WORK

Use work forecasts and field-usable records to prepare, assign, supervise, and refresh workers for defined needs.

5 ADVANCE PEOPLE AND RENEW KNOWLEDGE

Connect demonstrated growth to recognition, responsibility, leadership, teaching, continuity, and the next generation of workers.

These principles can be applied at different scales. A large employer may operate a staffed institute and digital record system. A smaller employer may use a modest shop, practitioner instructors, association resources, educational partnerships, mobile learning, and shared facilities. The relevant question is how consistently the parts are connected to the work and the workforce.

Implications for Contractors and Workers

For Contractors. The framework provides an operating model for building capability with greater consistency. Four connected actions translate the model into practice.

Table 3. Contractor Actions for Building a Capability System.

Step	Contractor action	What it means in practice
1	Make responsibility visible.	Assign a training director, craft-development leader, superintendent, human resources professional, or coordinated team to connect anticipated work, worker development, assessment, records, assignment, and advancement.
2	Define field-ready capability.	State the expectations for technical proficiency, safe execution, quality workmanship, productive performance, current credentials, and the conditions of authorization clearly enough to guide workers, coaches, assessors, and supervisors.
3	Put readiness evidence into field use.	Make assessment results, credentials, authorizations, and relevant experience available to field leaders in a form they can use for project preparation, assignment, and supervision.
4	Connect development to work and careers.	Prepare practitioners to teach and assess, time development to the work ahead, review performance after deployment, and link demonstrated capability to responsibility, compensation, recognition, and leadership. Use partnerships where they strengthen the system.

For Workers. A capability-centered system makes the pathway more visible. Workers should be able to:

- 1 Understand the pathway.** Know what they can learn, what ready performance looks like, and how a skill or role fits the work of the company.
- 2 Know who will support and verify growth.** Understand who will coach and assess them, what evidence is expected, and how achievement will be documented.
- 3 See what achievement can support.** Understand how demonstrated capability may connect to project assignments, compensation, recognition, responsibility, and advancement.
- 4 Shape the direction of development.** Request learning, deepen a specialty, pursue selected additional capability, or prepare for coaching and leadership.
- 5 Connect interests to the work ahead.** Discuss career interests and development goals in relation to upcoming projects, workforce needs, and available opportunities.

Implications for Owners, Policymakers, and Taxpayers

The same framework translates into practical actions for the organizations and public audiences that purchase, enable, and benefit from construction work.

Owners

- 1 Treat workforce capability as project readiness.** Evaluate whether the workforce plan is connected to the actual scope, sequence, systems, equipment, and conditions of the work.
- 2 Ask how readiness is established and used.** Ask how required capability is defined, how workers demonstrate it, how current records reach supervisors, how unusual or high-consequence work is rehearsed, and how field experience updates future preparation.
- 3 Create the conditions for focused preparation.** Share upcoming work information early, support project-specific preparation and controlled rehearsal when useful, and request capability evidence relevant to the work. This connects procurement, mobilization, execution, quality, and workforce development.

Policymakers

- 1 Recognize capability systems as workforce infrastructure.** Employer-embedded systems connect educational foundations to company standards, project demand, worker assignments, careers, and leadership.
- 2 Focus recognition on demonstrated capability and outcomes.** Support several credible pathways while maintaining clear expectations for safety, quality, access, current records, and measurable capability outputs.
- 3 Extend access across employer sizes and geographies.** Shared facilities, mobile resources, associations, and educational consortia can help smaller employers and distributed workforces use capability infrastructure that would be difficult to build alone.

Taxpayers

- 1 Look for two forms of public capacity.** Workforce investment can create skilled, durable, and meaningful career pathways for workers while expanding the qualified capacity available to deliver infrastructure and facilities.
- 2 Ask whether investment becomes usable capability.** A useful public test is whether workers demonstrate capability that can be applied to real work, sustained through careers, and renewed through future coaches, instructors, and leaders.

Five-Audience Practical Implications Matrix

Table 4 consolidates the practical meaning of the findings for the five principal audiences of this report.

Table 4. Five-Audience Practical Matrix.

Audience	Central question	Practical action	Value created
Contractors	How are the six functions connected in daily operations?	Assign ownership, define standards, prepare coaches and assessors, maintain usable records, time development to work, and connect capability to advancement.	Field-ready workers, project readiness, knowledge continuity, and a stronger workforce pipeline.
Workers	What can I learn, how will I demonstrate it, and what can it lead to?	Seek clarity on coaching, assessment, credentials, authorization, recognition, compensation, responsibility, and available pathways.	Mastery, agency, belonging, continuity, leadership, and durable career options.
Owners	How does the contractor know the proposed workforce is ready for this work?	Review task standards, qualification evidence, project-specific preparation, assignment controls, supervision, and feedback.	Greater confidence in mobilization, execution, safety, quality, and workforce continuity.
Policymakers	How can public policy recognize and extend high-quality capability development?	Focus on demonstrated outcomes, support multiple pathways and shared infrastructure, and improve access and measurement.	Broader workforce participation, stronger regional capacity, and more visible returns from workforce investment.
Taxpayers	Does workforce investment build capability that serves workers and public delivery?	Expect transparent evidence of skilled pathways, current readiness, opportunity, and delivery capacity.	Qualified careers, local opportunity, institutional knowledge, and capacity to deliver public needs.

The matrix translates the six core functions into the questions, actions, and forms of value most relevant to contractors, workers, owners, policymakers, and taxpayers.

The matrix shows that the audiences are connected. Contractors organize the system, workers develop and apply capability, owners create project demand and readiness expectations, policymakers shape access and recognition, and taxpayers receive the public value created through skilled careers and delivery capacity.

SECTION 7

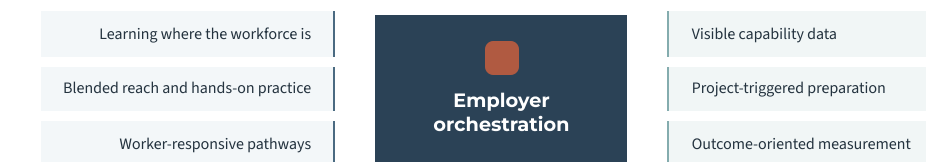
The Next Generation of Employer-Embedded Workforce Capability Systems Is Already Taking Shape

The systems documented in this study are continuing to evolve. Contractors described development that is moving closer to the work, reaching more distributed workers, responding more directly to worker needs, using capability records more actively, and connecting preparation to upcoming projects.

These developments do not replace the six core functions. They strengthen how the functions are carried out. Employer orchestration remains central because someone must connect delivery modes, practical verification, current records, work forecasts, worker interests, and career pathways into one operating system.

Figure 27 organizes the directions already visible across the participating cases.

The Next Generation Is Already Taking Shape



THROUGHOUT Access, readiness, continuity, and feedback

Figure 27. The Next Generation Is Already Taking Shape. The next generation of capability systems is becoming more mobile, blended, worker-responsive, data-rich, project-triggered, and outcome-oriented. The directions reinforce the same operating purpose: develop verified capability and connect it to work, careers, and organizational learning.

The figure emphasizes integration. Mobile or digital delivery expands reach. Practical coaching and assessment establish readiness. Capability data support assignment and renewal. Work forecasts create timing. Worker input shapes relevance. Outcome measures show whether development has become usable capability.

Learning Wherever the Workforce Is

Construction workforces are distributed across projects, markets, shifts, travel schedules, and changing weather conditions. Participating contractors were extending learning through mobile classrooms, jobsite trainers, live virtual instruction, on-demand content, multilingual delivery, and partnerships that bring resources closer to workers.

- One national electrical and instrumentation contractor described mobile training units and instructors placed on larger projects. Live virtual instruction connected workers in several locations, while local coordinators and hands-on practice supported application. The same contractor was developing sequential on-demand content for workers whose project schedules made live attendance difficult.
- A national contractor combined mobile learning spaces, jobsite trainers, live virtual instruction, and on-demand content to reach traveling and distributed workers. The delivery approach could shift with project size and location while hands-on practice and local support remained part of capability development.

A second example shows how on-demand learning can also support earnings continuity for workers who travel to projects.

REAL EXAMPLE FROM THE STUDY

Keep Earning and Keep Learning During Weather Interruptions

A regional concrete contractor created an on-demand continuing-education platform for traveling workers and guaranteed approximately 24 to 40 hours of paid learning that could be used when rain-outs or other weather-related shutdowns interrupted field production. Workers could continue earning while completing courses on safety, personal finance, personal health and fitness, nutrition, leadership, contracts and legal topics, and other professional or personal-development subjects. Company leadership designed the approach as an investment in its people and as a way to make travel-based employment more stable when weather interrupted the work.

REGIONAL CONCRETE CONTRACTOR

PARTICIPANT-REPORTED PRACTICE

The operating opportunity is broader access without losing the connection to demonstrated performance. Digital and mobile formats can carry explanation, demonstration, review, knowledge checks, and complementary development. Coaches, practical environments, and assessors can then connect technical learning to the work and verify readiness.

Multilingual instruction and communication support extend the same principle. Workers can engage more fully when technical expectations, safety requirements, and leadership practices are accessible, while the standards for demonstrated performance remain clear and consistent.

Preserving and Extending Knowledge

The departure of experienced workers creates a knowledge challenge for every construction employer. Capability systems offer a way to convert individual experience into organizational memory. Participating employers were already turning field knowledge into courses, demonstrations, mock-ups, procedures, checklists, digital libraries, coaching routines, and updated standards.

Practitioner involvement is essential because the value is not only in documenting information. Experienced workers interpret sequence, context, common errors, decision points, and the practical reasons behind a standard. Their review keeps learning connected to the work.

Figure 28 shows how field knowledge can move through the capability system and return to the field in a more reusable form.

How Capability Systems Preserve and Extend Knowledge



Figure 28. How Capability Systems Preserve and Extend Knowledge. Capability systems preserve knowledge by converting field experience into reusable learning resources and leadership roles. Feedback from later use updates the content, allowing knowledge to move across workers, projects, and generations rather than remaining with one individual.

The cycle creates value for both the organization and the experienced worker. The organization retains hard-earned knowledge. The worker gains a pathway to teach, assess, lead, and contribute beyond a single task or project. Knowledge continuity therefore becomes part of career architecture and succession planning.

A living knowledge library grows through repeated documentation, practitioner review, field application, and revision. It supports new workers, current workers, project preparation, instructor development, and the next generation of leaders.

Data-Rich and Project-Responsive Systems

Capability records are positioned to become a more active operating spine. Several documented systems already connected learning, sign-offs, credentials, renewal dates, and authorization. The next step is to make those records more consistently useful for project forecasting, worker selection, focused refresh, assignment, compensation, advancement, and system feedback.

Project-responsive systems start with the work ahead. Backlog, schedules, unusual systems, owner requirements, and expected phases can identify capability needs before mobilization. Employers can then select workers, provide focused learning or rehearsal, verify readiness, and carry the results into the assignment decision.

The same architecture can become more worker-responsive. Coach matching, demonstrated-readiness progression, worker-requested topics, multilingual support, and several delivery modes allow development to fit different starting points, interests, and career directions.

Outcome-oriented measurement completes the future direction. Participation, hours, completion, and credentials remain valuable records. Capability measures add evidence of technical proficiency, safe execution, quality workmanship, productive performance, field-leader readiness, project readiness, advancement, and organizational continuity.

Policy support can accelerate infrastructure that already exists. The opportunity is to help established systems reach more workers and employers, improve access across company sizes and geographies, and make capability outcomes more visible without prescribing one administrative form for every trade or employer.

The next generation of capability systems is becoming more mobile, blended, worker-responsive, data-rich, project-triggered, and outcome-oriented.



SECTION 8

Limitations and Recommendations for Future Research

This study provides an empirically grounded framework for understanding how participating construction employers develop, verify, deploy, sustain, and advance workforce capability. The limitations below define how the findings should be interpreted and identify the next research opportunities.

Research Design and Sample

The study used a purposive, qualitative sample. Participating organizations were selected because they could provide relevant evidence about workforce development, multiskilling, project practices, training facilities, or related operating systems. The sample was not randomly selected and does not support an estimate of how common the six functions or specific practices are across the full U.S. construction industry.

The 48 participating organizations, 80 interviews, 18 trades, 23 headquarters states, seven training-facility visits, and 18 project or site visits provided substantial diversity of organization type, work setting, role, and geography. That breadth strengthens the cross-case framework, but it does not make the sample nationally representative.

The research design was intended to identify recurring functions, mechanisms, cases, and practical meaning. It was not designed to estimate causal effects of capability systems on injury rates, quality, productivity, wages, retention, fulfillment, or project outcomes. The six core functions are a descriptive framework grounded in the participating evidence. They are not a certification standard or a claim that every employer uses all six functions at equal maturity.

Interviews and observations occurred in different settings and at different levels of depth. Some cases included detailed interviews, direct facility observations, company records, and process materials. Others relied primarily on participant descriptions. The evidence labels used throughout the report make those differences visible.

Company Records, Self-Report, and Anonymity

The study reviewed selected company records rather than a uniform record package from every organization. Available materials varied in structure, time period, definitions, and level of detail. Company-record evidence therefore supports the specific case in which it appears rather than a pooled estimate across the entire sample.

The retention analysis came from one employer and showed a strong association between development participation and continued employment. It did not isolate the effects of worker motivation, advancement, project opportunity, supervision, compensation, or other employment conditions. The analysis should be interpreted as company-record evidence of association.

Several quantities concerning investment, participation, program scale, and operating practice were reported by participants. The research team did not independently audit every self-reported value. Distinctive quantities were rounded and identifying combinations were separated in the published treatment.

Complete anonymity also limits the amount of detail that can be shown. Company names, program names, locations, worker identities, facility features, and distinctive combinations of facts are withheld. Quotations are usually paraphrased. These controls reduce the ability of readers to independently identify and compare individual cases, while allowing participants to contribute detailed evidence. The research team retains a private source database and crosswalk for internal auditability. **Table 5** summarizes these evidence boundaries and the report treatment applied to each.

Table 5. Evidence Boundaries and Report Treatment.

Evidence area	Primary boundary	Report treatment
Sample	Purposive and not nationally representative.	Use recurring functions and representative cases within the participating sample.
Interviews and observations	Depth and setting varied across cases.	Use evidence badges and avoid converting one case into a population-wide claim.
Company records	Selected, nonuniform, and case-specific.	Keep record scope visible and avoid pooled causal estimates.
Self-reported quantities	Not independently audited in every case.	Round distinctive values and label participant-reported evidence.
Anonymity	Names, locations, and distinctive details are withheld or separated.	Use broad descriptors, paraphrased perspectives, and a private internal crosswalk.

The boundaries constrain the strength and scope of claims while allowing the report to preserve traceable, real examples from the participating sample.

Future Research on Safety and Worker Fulfillment

Future safety research should test the safety-relevant mechanisms identified in this report. Priority topics include hazard recognition across adjacent work, the quality and currency of task qualification, worker understanding of authorization boundaries, preparation for unfamiliar work, near misses, task planning, work-area coordination, and activity-specific injury outcomes. Designs should distinguish the capability a worker holds, the task to which it is applied, the supervision provided, and the conditions of the work.

Worker fulfillment also requires direct measurement. Future studies should ask workers about satisfaction, purpose, mastery, agency, belonging, perceived opportunity, leadership, family stability, continuity of work, physical career sustainability, and the meaning they attach to skill growth. Longitudinal designs can examine how those experiences change as workers enter, progress, gain additional capability, teach others, or move into leadership.

These studies should combine worker surveys and interviews with training records, assignment history, hours worked, compensation, promotion, retention, absenteeism, and safety participation where available. Worker voice should remain central so that the research measures the quality of the experience rather than relying only on employer records. **Table 6** organizes the priority endpoints, potential data sources, and collection approaches for this next phase.

Table 6. Future Research Measurement Menu.

Research area	Priority endpoints	Potential data sources	Collection approaches
Worker safety	Hazard recognition, task qualification, authorization clarity, near misses, safety climate, activity-specific outcomes.	Worker assessments, qualification records, observations, incident and near-miss records, supervisor assessments.	Pre- and post-development assessment, field follow-up, matched task or crew comparisons, longitudinal tracking.
Worker fulfillment	Mastery, agency, belonging, purpose, continuity, family stability, career sustainability, leadership.	Worker surveys, interviews, focus groups, assignment records, hours, compensation, promotion, retention.	Repeated worker surveys, anonymous interviews, cohort tracking, case narratives, linked record analysis.

The menu separates future endpoints from data sources and collection methods so later studies can test worker outcomes directly rather than infer them from training participation or employer practice.



SECTION 9

Conclusion

Taken together, the findings describe a construction employer as both an operating organization and a learning organization. Employer orchestration connects people, partnerships, curricula, instructors, coaches, learning environments, assessment, records, project demand, and career mechanisms into one capability system.

The central contribution is the system-level view. Construction employers can be places where capability is continuously developed, verified, applied, renewed, and passed forward. Learning is connected to a defined standard. Workers develop through instruction, practice, coaching, and experience. Readiness is demonstrated and documented. Capability is assigned to real work, refreshed through feedback, and converted into careers, leadership, and continuity.

The worker remains at the center of the system. A well-functioning capability system gives workers clearer standards, invested coaches, opportunities to demonstrate growth, recognition of achievement, choices across a career, and ways to contribute to the next generation. Employer and project value grows from that same worker development.

That insight strengthens the larger research series for *Multiskilling in the U.S. Construction Industry*. Multiskilling is one application of verified capability. The employer-embedded capability system explains how workers become ready for that application and for many others, including deep specialization, equipment qualification, controlled fabrication, field leadership, project-specific preparation, coaching, and instruction.

SEVEN CONCLUDING TAKEAWAYS — WHAT THE STUDY SHOWS

- 1 Employer-embedded workforce capability systems function as organizational infrastructure that connects learning, readiness, work, and careers.
- 2 Six core functions describe how participating employers govern, recruit, develop, verify, deploy, and renew capability.
- 3 Capability assurance integrates technical proficiency, safe execution, quality workmanship, and productive performance.
- 4 Verified capability is the foundation for responsible specialization, multiskilling, equipment operation, fabrication, leadership, and project-specific readiness.
- 5 Worker value extends through continuity, hours, mastery, agency, belonging, leadership, family responsibility, and career sustainability.
- 6 Projects and capability systems improve one another when work forecasts shape preparation and field experience updates future standards and learning.
- 7 The same system can build worker opportunity and employer, project, owner, and public delivery capacity.

References

- Ahmadian Fard Fini, A., Rashidi, T. H., Akbarnezhad, A., and Waller, S. T. (2016b). Incorporating Multiskilling and Learning in the Optimization of Crew Composition. *Journal of Construction Engineering and Management*, 142(5), 04015106.
- Albalawi, R. K., Goodrum, P. M., and Taylor, T. R. (2023). Applying the Tier II Construction Management Strategy to Measure the Competency Level Among Single and Multiskilled Craft Professionals. *Buildings*, 13(5), 1175.
- Albalawi, R., Goodrum, P. M., and Albattah, M. A. (2024). Evolution of Multiskilled Craft Professionals and Their Level of Certification in the US Industrial Construction Sector. *Journal of Management in Engineering*, 40(1), 04023057.
- Burleson, R. C., Haas, C. T., Tucker, R. L., and Stanley, A. (1998). Multiskilled Labor Utilization Strategies in Construction. *Journal of Construction Engineering and Management*, 124(6), 480-489.
- Carley, L. A., Haas, C. T., Borcharding, J. D., and Goodrum, P. M. (2003). Experiences With Multiskilling Among Non-Union Craft Workers in US Industrial Construction Projects. *Engineering, Construction and Architectural Management*, 10(6), 374-381.
- Castañeda, J. A., Tucker, R. L., and Haas, C. T. (2005). Workers' Skills and Receptiveness to Operate Under the Tier II Construction Management Strategy. *Journal of Construction Engineering and Management*, 131(7), 799-807.
- Gomar, J. E., Haas, C. T., and Morton, D. P. (2002). Assignment and Allocation Optimization of Partially Multiskilled Workforce. *Journal of Construction Engineering and Management*, 128(2), 103-109.
- Haas, C. T., Rodriguez, A. M., Glover, R., and Goodrum, P. M. (2001). Implementing a Multiskilled Workforce. *Construction Management and Economics*, 19(6), 633-641.
- Nasirian, A., Arashpour, M., and Abbasi, B. (2019a). Critical Literature Review of Labor Multiskilling in Construction. *Journal of Construction Engineering and Management*, 145(1), 04018113.
- Nasirian, A., Abbasi, B., Cheng, T. C. E., and Arashpour, M. (2022). Multiskilled Workforce Planning: A Case from the Construction Industry. *Journal of Construction Engineering and Management*, 148(5), 04022021.
- Shang, G., Low, S. P., and Wee, J. H. (2020). Drivers and Barriers for Multiskilling Workers in the Singapore Construction Industry. *International Journal of Construction Management*, 20(4), 289-304.
- Wang, Y., Goodrum, P. M., Haas, C. T., and Glover, R. W. (2009). Analysis of Observed Skill Affinity Patterns and Motivation for Multiskilling Among Craft Workers in the US Industrial Construction Sector. *Journal of Construction Engineering and Management*, 135(10), 999-1008.

Appendix A · Key Terms Used in This Report

Term	Working definition used in this report
Training activity	An instructional event or learning opportunity. It can contribute to capability, but participation, attendance, or course completion alone does not establish readiness for defined work.
Employer-embedded workforce capability system	A sustained, employer-orchestrated arrangement of people, partnerships, curricula, learning environments, assessment practices, records, and career mechanisms through which a construction firm recruits, develops, verifies, deploys, refreshes, and advances worker capability in response to project and workforce needs. After first use, the report may shorten this term to capability system.
Sustained, employer-orchestrated, arrangement, and embedded	Sustained means the system continues beyond a single event. Employer-orchestrated means the employer determines how the components connect to its work, standards, assignments, and career pathways without needing to own or deliver every component. Arrangement recognizes that the system may take many organizational forms. Embedded means the system is connected to recruitment, planning, preparation, assignment, supervision, recognition, advancement, and retention.
Employer orchestration	The active coordination of people, partnerships, learning resources, standards, records, project demand, assignments, and career mechanisms into one operating capability system.
Capability	The usable outcome of learning and experience. It includes the knowledge and practical ability required for defined work, applicable safety understanding, demonstrated quality, productive performance where relevant, and current evidence of any required credentials or authorization.
Capability lifecycle	The recurring system through which an employer senses workforce and project needs; recruits, prepares, develops, assesses, deploys, refreshes, and advances workers; and uses feedback from projects, workers, technology, and experienced practitioners to improve the next cycle.
Blended learning	The intentional combination of structured instruction, coached practice, repetition, simulation, field experience, and feedback selected to match the capability being developed.
Verified capability	Current, documented, role-appropriate evidence that a worker can perform defined work to the required technical, safety, quality, and productive-performance standard and holds any required credentials or authorization. It is evidence of readiness, not participation alone.
Capability assurance	The organizational process that connects standards, instruction, coached practice, demonstration, verification, records, authorization, assignment, supervision, review, and refresh to establish and maintain readiness for defined work.
Project-specific readiness	The condition in which required worker and crew capability has been matched to a defined project scope, task, equipment need, work sequence, owner or client condition, and supervision plan.

Appendix A continues on the next page.

Term	Working definition used in this report
Assessment	A structured method of gathering evidence that a worker or leader can perform defined work or responsibility to the expected standard.
Authorization	The employer decision that a worker may perform defined work or operate defined equipment under stated conditions and supervision.
Refresh	Focused learning, practice, review, reassessment, or renewal used to keep capability current or prepare a worker for changed work, equipment, technology, project conditions, or responsibilities.
Capability record or capability data	Current, accessible information about a worker's development, demonstrated skills, credentials, sign-offs, relevant experience, renewal dates, authorization, and conditions of use. Capability records support assignment and supervision but do not replace professional judgment.
Coach	An experienced practitioner prepared to guide practice, provide feedback, and support a worker's development.
Assessor or certifier	A qualified person who evaluates demonstrated performance against a defined standard and records the result.
Deployment	The controlled matching and assignment of verified capability to defined work, project needs, and required supervision.
Cross-training	Development that enables a worker to perform selected tasks or work processes beyond the worker's primary trade or work assignment. Cross-training describes the development process through which additional capability is built.
Multiskilling	A workforce strategy and qualified application of verified capability in which workers are qualified to perform selected tasks safely and competently across more than one trade, craft, or skill classification. Multiskilling describes the resulting capability or workforce application, not informal or uncontrolled task switching.
Workforce continuity	The employer's ability to retain, redeploy, develop, and renew qualified workers and organizational knowledge across projects, phases, seasons, and careers.

Note: These are working definitions used in this report. They do not replace applicable licensing, credentialing, contractual, or regulatory requirements. The evidence categories used to label cases and participant perspectives are defined separately in Section 3.5.

Together, these terms establish the report's central sequence: employers organize the system, develop capability, verify and document readiness, connect capability to defined work, keep it current, and convert it into careers, leadership, workforce continuity, and delivery capacity.



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