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From Training to Performance:

Evaluating the ROI of Craftworker Development

2025

Workforce Development Research Report

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Abstract:

With workforce shortages, aging craft workers, and a declining pool of skilled labor, companies face increasing challenges in meeting staffing demands and maintaining productivity. With that in mind, this report investigates the impact of craft worker training on productivity, retention, safety, and other key performance metrics within the construction industry. Following a mixed-methods research approach, we collected data from industry stakeholders and employees through multiple surveys and interviews to evaluate how training affects performance outcomes. Results indicate that companies investing in structured training programs experience improved productivity, reduced rework, and higher worker proficiency. Additionally, training positively correlates with retention rates, safety outcomes, enhanced collaboration, quality of work, and adherence to safety standards. This report underscores the critical need for comprehensive workforce development strategies to address ongoing labor shortages and sustain long-term industry growth.

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Introduction

The construction industry is the backbone of economic growth, powering infrastructure, employment, and investment across every sector of the economy. In the U.S., construction contributes approximately 4.3% to the gross domestic product (GDP), and organizations supporting the industry employ 3% of the U.S. workforce (Karahan et al., 2023 Kolmar, 2023). The industry's performance and output depend heavily on the availability and capability of skilled craft professionals. Skilled craft professionals are the foundation of successful project execution, helping to ensure projects meet safety, quality, and design standards. These workers install products, materials, and equipment in accordance with designed and engineered plans. Skilled craft workers are essential to the successful completion of construction projects, ensuring that facilities are built to specification and industry standards. A lack of qualified workers can lead to: (a) cost

overruns, (b) schedule delays, (c) lower quality work, (d) increased rework, (e) less safe practices, and (f) decreased productivity.

Despite the critical role these individuals play, the construction industry continues to deal with craft worker shortages and challenges regarding effective skills development and training. Healy et al. (2011) identified two major reasons for the shortage of skilled craft workers in the U.S. construction industry: a lack of training and the inability to attract and then develop younger generations of workers. Establishing effective training programs can not only address training gaps but also support efforts to attract and retain new entrants to the craft workforce. This type of program development needs to include formal classroom training as well as field experience, as one or the other alone does not impart the necessary skills to perform craftwork.

Although there is increasing focus on craft training as a workforce solution, little is known about the quality of these programs or their measurable impact on job performance. Research on how training influences productivity, safety, and retention is limited, and the financial return on training investments remains largely undocumented. As a result, many organizations lack the data needed to make informed decisions about training strategy and workforce development.

Understanding the return on investment (ROI) of craft worker training is essential for organizations seeking to optimize their workforce development strategies and build a more skilled, efficient, and sustainable workforce. Furthermore, understanding and computing ROI can help organizations understand and mitigate risks associated with poor craftsmanship, rework, and safety incidents (Wang et al., 2009).

The purpose of this study is to gain a greater understanding of the impact of higher-quality training on: (a) cost, (b) time, (c) quality, (d) safety, and (e) productivity for construction organizations. Additionally, this study hopes to uncover if there is a corresponding positive impact on tangential aspects of craft worker training, such as absenteeism and retention.

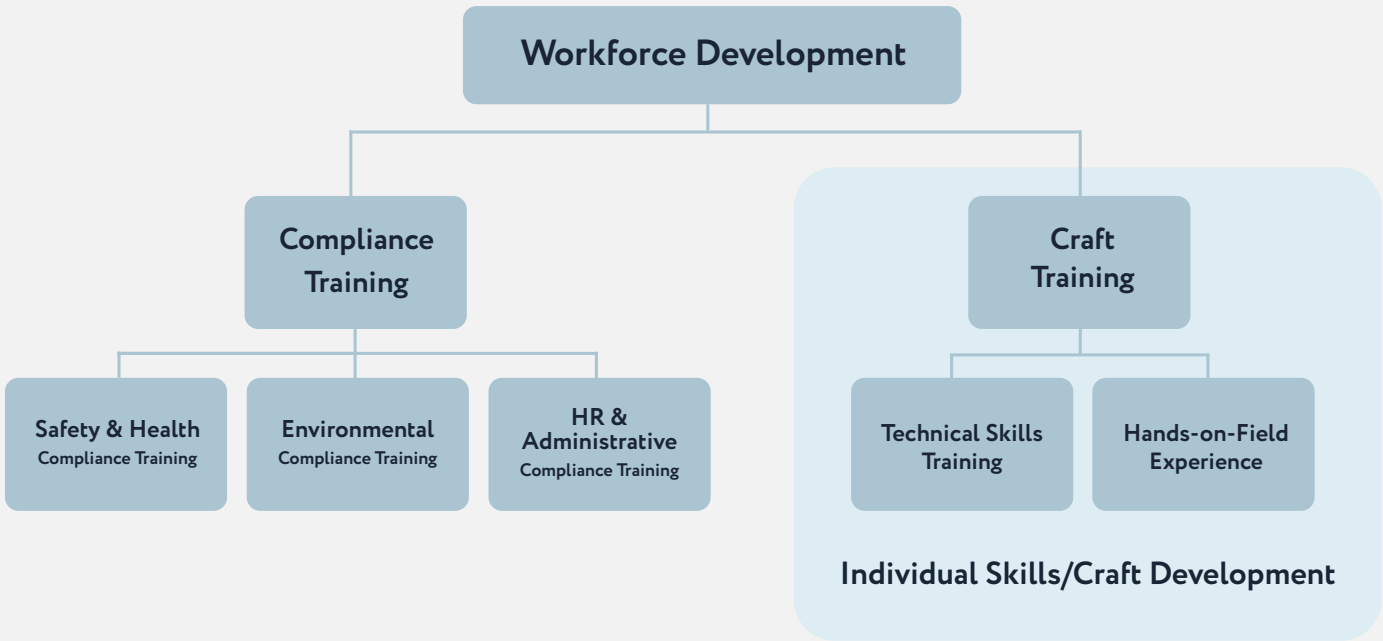
Literature Review

Investing in workforce training is not just beneficial, it is essential to the construction industry's productivity, safety, and quality outcomes (Gambatese; & Hinze, 1999 Goodrum & McLaren, 2003). Effective training supports both technical skill acquisition and long-term career development and worker retention (CPWR, 2018). In an industry that depends heavily on the capabilities of its skilled labor force, the ability to train and retain craft professionals plays a critical role in ensuring projects are completed safely, on time, and to standard. Yet, despite clear evidence of its benefits, according to the National Academies of Sciences, Engineering, and Medicine (NASEM, 2021), workforce training remains underutilized across the construction sector.

This literature review explores key research related to craft worker training, technical skills development, workforce retention, and the impact of training quality on construction project performance. The following sections examine various training approaches, including: (a) on-the-job training (OJT), (b) formal classroom instruction, (c) workplace training, and (d) apprenticeships. Additionally, this review addresses

FIGURE 1

Overview of Workforce Development in Construction



the challenges and barriers to training, the correlation between training and worker satisfaction, and the broader implications of skilled labor shortages. By synthesizing existing research, this literature review aims to provide a foundation for understanding how effective training investments contribute to workforce stability, project success, and overall industry sustainability.

This report understands and defines workforce development as being composed of several distinct training categories, including safety compliance and craft skills training. Craft skills training that advances workers' education is also referred to as "craft worker development." This development hinges on a combination of technical skills training and hands-on field experience, as shown in Figure 1.

Technical Skills Training

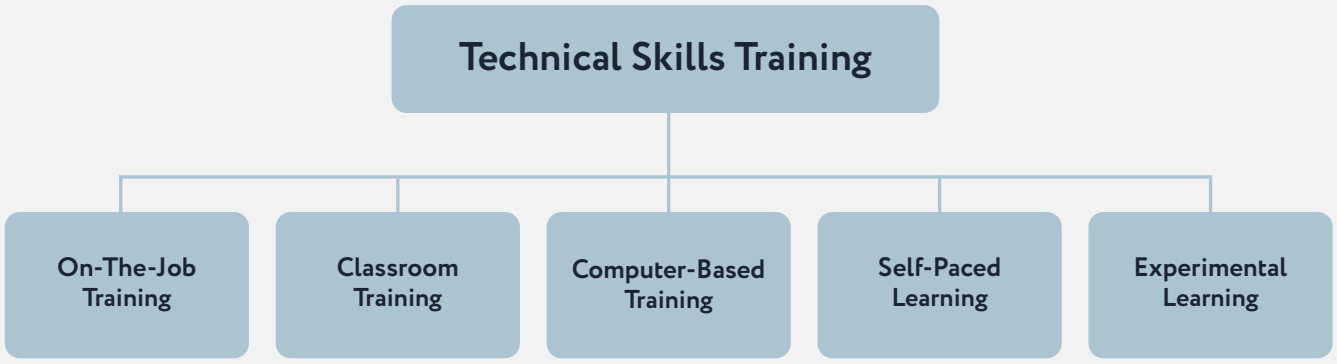
Technical skill training can be defined as training to educate an individual in specific skills required for any particular trade (Grugulis, 2006). Skilled craft workers gain knowledge, skills, and abilities (KSAs) from several sources including: (a) classroom training, (b) on-the-job training (OJT), (c) computer and internet-based learning (CBT), (d) self-paced learning, (Wang et al., 2008; Goodrum et al., 2007), and (e) from gaining experience on the job as shown in Figure 2.

Many studies confirm that the attainment of technical skills by construction craft workers leads to: (a) improved project performance, (b) promotion of the employee, (c) higher pay, and (d) elevated status within their organization (Goodrum et al., 2007; Hysong, 2008; Wang et al., 2008). Additionally, as craft workers build their skills and gain field experience, they become more self-sufficient and require less direct oversight. This increased autonomy allows them to take on advanced responsibilities, mentor others, and move into leadership roles such as crew leads, foremen, or site supervisors.

To better understand how craft workers acquire technical skills through training, it is helpful to examine the distinct methods of training used across the industry. Each training method offers unique advantages and applications. The following sections

FIGURE 2

Overview of Technical Skills Training in Construction



provide a detailed overview of these approaches and highlight the role each plays in developing a highly skilled and adaptable workforce.

On-the-Job Training

OJT is a hands-on approach to technical skill training. OJT is considered valuable for construction craft training when combined with: (a) a learning plan, (b) on-site mentoring, (c) continuous feedback, and (d) rotational exposure to various crafts in the industry (Goodrum et al., 2007). OJT is a standard method for learning skills in the field and in many cases does not require extensive or expensive setup such as a classroom environment or dedicated training area.

OJT places craft workers in real-world situations to perform under the watch of a mentor or supervisor. Some common benefits of OJT according to Harper et al. (2023) include: (a) less experienced craft workers are allowed to shadow more experienced craft workers to gain a greater understanding of specialized knowledge and work, and (b) trainers and mentors have the opportunity to devote as much time as needed to the development of the trainee, which can help avoid learner frustration from being pushed to learn too much information before they are ready. Wang et al. (2008) noted that while OJT, whether formal or informal, is highly valuable, it cannot fully replace the structured learning provided by classroom-based training. As such, OJT is most effective when integrated into a broader training system that includes multiple instructional approaches.

Formal Training

Formal training consists of classroom and laboratory training, including instructor-led classroom training and hands-on applications in the classroom, laboratories, or controlled, simulated field environments. Typically, formal training is provided to new hires to gain basic skills, while experienced craft workers also partake in formal training to enhance existing skills and gain new skills (Burleson et al., 1998).

Formal training is essential for craft workers as it imparts crucial skills such as: (a) basic safety requirements, (b) construction math, (c) blueprint reading, (d) tool usage, and (e) trade-specific knowledge. According to a survey conducted by Wang et al. (2008), basic safety was identified as the most important subject in the curriculum of a formal classroom craft training program, followed by: (a) an introduction to power tools and hand tools, (b) construction math, and (c) basic employability skills.

Computer-Based Training

CBT is an increasingly popular method for delivering technical skills training in the construction industry. It involves the use of digital platforms, interactive modules, and multimedia resources to provide learners with a flexible, scalable, and standardized training experience. CBT can be delivered via desktop applications or web browsers, web-based learning management systems (LMS), or mobile applications and training platforms.

Some of the benefits of CBT training are that it can provide standardized levels of training and provide consistency for organizations across multiple locations and work sites. It is also flexible in that learners can complete training at their own pace and revisit material as needed (Burke et al., 2006; Trifu et al., 2024). CBT is also highly cost-effective as it reduces the need for in-person instruction and minimizes travel costs (Warn, 2023).

When developed well, CBT can be made more engaging by incorporating videos, simulations, and interactive quizzes to reinforce learning. CBT is especially effective for delivering safety training, procedural instruction, and compliance-based learning. Using characteristics and tools suggested by Lee et al. (2000) and Mayer (2014, 2020), CBTs can engage learners through: (a) audio narration, (b) animations, (c) videos, and (d) interactive scenarios.

Self-Paced Learning

Self-paced learning provides craft workers the opportunity to progress through training materials independently. This benefit provides adult learners with a greater degree of flexibility in learning, which can be advantageous for those with varying schedules and learning speeds (Robinson & Persky, 2020). Self-paced training can take multiple forms—ranging from digital formats such as using CBT and online modules to more traditional resources like printed manuals, books, or handouts.

This type of learning, based on the learner setting aside and finding opportunities for their own training, has several key benefits including: (a) accommodating different learning styles so that learners can spend more time on complex topics while moving quickly through familiar material (Tullis & Benjamin, 2011), (b) encouraging lifelong learning by promoting continuous skill development outside of structured training programs, and (c) supporting workforce development by helping workers prepare for certifications, licensing exams, and career advancement opportunities.

Formal and Informal Workplace Training by the Employer

Employer-provided training or workplace training has been found to be more effective than formal training by third-party training organizations, owing to several unique factors. These factors include the ability to immediately transfer the technical skills learned from training to the worksite. Other factors that increase the effectiveness of training at the worker's own worksite include both the opportunity to get immediate feedback from the trainee's supervisors and coworkers during training, and quick access to up-to-date equipment and materials that the trainee would use on the jobsite (Detsimas et al., 2016; Eck, 1993).

Albattah et al. (2022) advised that regular craft worker capacity training by employers yields the benefits of maximum productivity, retention, loyalty to the company, minimal rework, and less turnover. Therefore, offering workplace training benefits the development of a highly skilled craft workforce for organizations. However, not all companies have the capacity or resources to offer workplace training for craft workers.

Features of Craft Training in Workforce Development

Workforce development in the construction industry continues to rely heavily on the cultivation of craft skills through hands-on training and technical instruction. This section explores the primary pathways through which craft training occurs, including apprenticeships, technical skill providers, and structured training programs, and examines how these avenues contribute to worker satisfaction, productivity, and long-term workforce sustainability.

Apprenticeships

Apprenticeship continues to play a vital role in developing a skilled construction workforce, though it comprises a smaller share of the total workforce than it did in previous years. According to the U.S. Department of Labor (2024), there are approximately 340,000 active construction apprentices in the United States, representing about 4% of the national construction workforce. Apprenticeship programs typically require a multi-year commitment, often ranging from two to five years, depending on the trade. During this time, apprentices complete a required number of supervised OJT hours alongside related technical classroom instruction. Apprentices generally start at a wage below the journey-level rate, with increases tied to training progress. Formal classroom training is typically offered during work hours when permitted by employers or outside of work through evening and weekend programs. These courses are most often taught by experienced journey-level workers or craft professionals active in the field (Glover & Bilginsoy, 2005).

Technical Skill Training Sources/Providers

In their study, Wang et al. (2008) identified various sources of craft training in the U.S. construction industry, such as (a) organizations that sponsor and conduct apprenticeship programs, (b) community colleges and vocational-technical schools, (c) military training, (d) company-sponsored training, and (e) third-party construction organizations.

There are various ways craft workers gain technical skill training in their specific trades. This training can be either internal, through the organization, or external, by partnering with another organization to provide the training. Some of these external sources include Associated Builders and Contractors (ABC), Association of General Contractors (AGC), the National Highway Institute (NHI), and the American Association of State Highway and Transportation Officials (AASHTO) Technical Training Solutions.

Training and Career Satisfaction

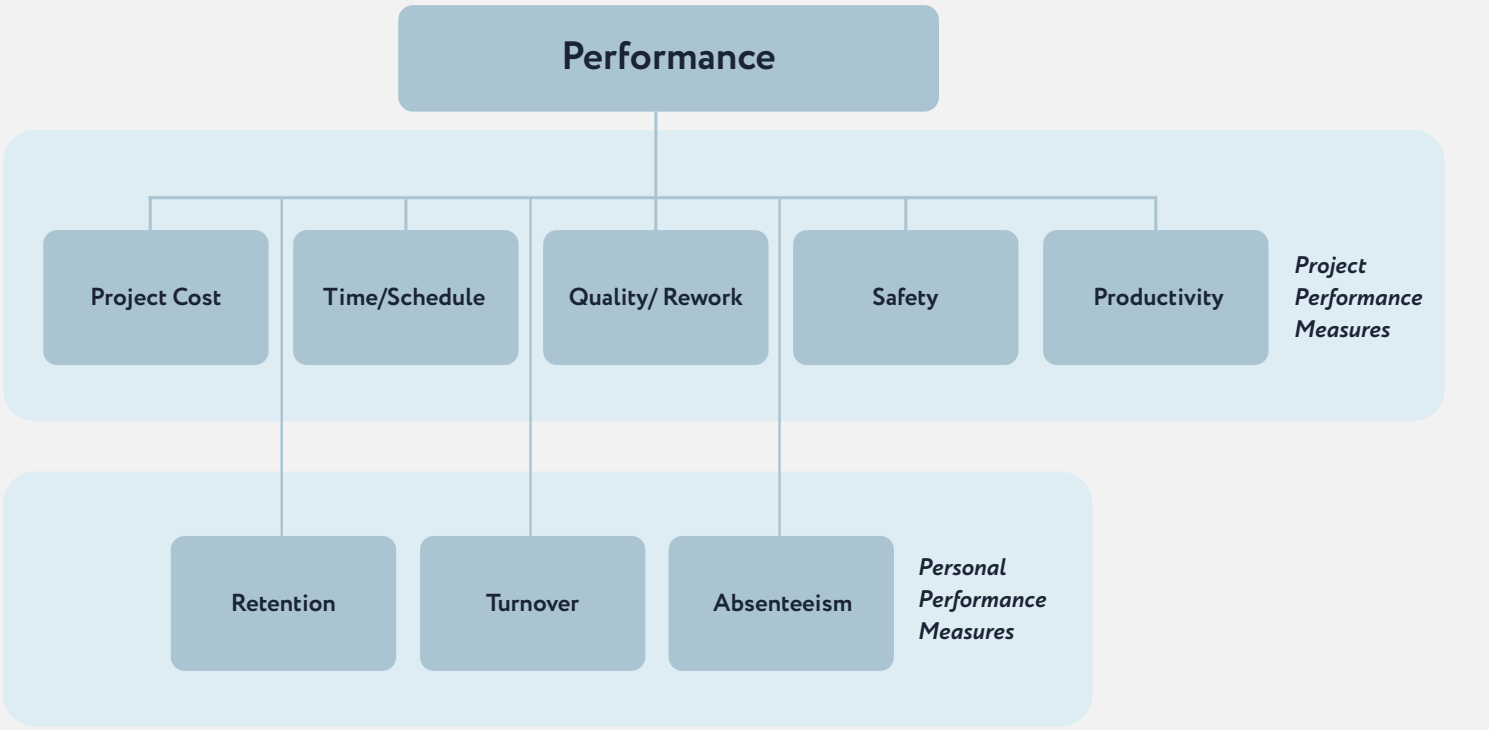
Halvorsen (2005) described job satisfaction as a relative concept, shaped by each worker's perceptions of their training and relationship with management. Building on this, Yang (2010) found that access to quality craft training significantly enhances job satisfaction. Higher satisfaction, in turn, has been linked to lower absenteeism and reduced turnover among craft workers. Supporting this connection, Goodrum et al. (2007) found that workers who received craft training not only reported significantly higher career satisfaction but also demonstrated stronger engagement, retention, and commitment to the construction workforce.

Project Performance Measures

Hysong (2008) mentioned that the quality of technical skill training on project performance is relative to the project and that the impact of technical skill can be measured at the job level. The areas of performance

FIGURE 3

Project Performance Measures



related to this research study include: (a) project cost/budget, (b) schedule/time, (c) quality and rework, (d) safety, (e) productivity, (f) retention, (g) turnover, and (h) absenteeism as shown in Figure 3.

Project Cost/Budget

Project cost represents all costs spent on a project. For contractors, cost includes the budget for all work performed by the company, including costs attributable to work added or deducted by change order. For owners, project costs generally exclude land and site preparation costs (CII, 2016). Karimi et al. (2018) studied project cost performance and highlighted the significance of the skilled labor shortage as a key factor contributing to cost overruns in construction projects.

Time/Schedule

Time and schedule performance refer to the ability of a project to meet planned milestones and completion dates. In construction, delays are often caused by a lack of labor, whether skilled or unskilled, poor planning, or coordination issues. These delays can negatively impact productivity, extend project durations, and lead to increased costs due to prolonged labor use and material storage (Lipke et al., 2009; Ogunlana et al., 1996). Shortages of skilled craft workers have been identified as a recurring cause of schedule slippage. When workers lack the necessary skills and experience, tasks take longer to complete, planned work can be disrupted, and there can be a reduction in efficiency among trades. As projects increasingly aim for accelerated schedules and tighter deadlines, workforce readiness becomes increasingly critical.

Quality and Rework

Rework is a measure of quality as it is indicative of the additional efforts needed to correct subpar original work. Rework can be defined as the unnecessary effort of redoing a process or activity that was incorrectly implemented the first time to conform to the original requirements (Love, 2002). According to CII (2018), the rate of rework is the amount of rework, wastage, and off-quality work produced during a project or within a company during a given period of time.

Rework can result from many causes, including lack of skilled labor, lack of skilled supervisors, change orders, poor quality materials, confusing plans and specifications, and improper planning. According to Mahamid (2024), rework continues to affect cost and schedule performance throughout the construction industry. Rework can cost up to three times the original cost budgeted for the work, and it usually takes considerably more time to redo work than it would have taken had it been done correctly the first time.

Safety

A study by Ahmed et al. (2018) emphasized efforts in training quality in terms of teaching basic ideas of safety measures, health and hygiene, risk management, and other fundamental issues of construction health and safety. In a study by Wang et al. (2008), the authors ranked craft workers on eight core subjects using a five-point Likert scale and the Relative Importance Index (RII). The findings showed that basic safety ranked the highest. Their results suggest that craft workers understand the value of safety as one of the major components of craft worker training.

Multiple training efforts have yielded improvements in the health and safety culture of craft workers in the U.S. construction industry, resulting in a continuous decline in the number of work-related injury fatalities (CII, 2021). This decline has been shown in the data by OSHA's recordable rate for measuring safety, the rate at which a worker receives treatment beyond basic first aid for an occupational injury or illness (OSHA, 2023). These findings collectively emphasize that both perceived value and measurable improvement of safety underscore the importance of safety training in construction.

Productivity

Productivity in construction refers to the industry's efficiency in utilizing resources, particularly labor hours, to complete projects. A report by CII (Goodrum et al., 2007) defines productivity rate as the number of hours used to complete a given quantity of work.

According to Vereen (2013), the goal of improving productivity is to reduce input while increasing output.

In a study by Rojas & Aramvareekul (2003) on labor productivity, four categories were analyzed for their influence on productivity. The factors they identified included: (a) management systems, (b) worker power, (c) industry environment, and (d) external conditions. Among the four categories analyzed, the "worker-power factor," which includes experience, training, education, motivation, and seniority, was ranked as the second most influential contributor to labor productivity, following management systems.

These findings highlight the critical importance of investing in the craft workforce, particularly through training and development, as a key strategy for boosting productivity across the construction industry.

Retention

Retention rates should not be confused with turnover rates. Retention rates focus on measuring employee retention, which is a positive aspect of hiring and working, rather than the undesirable or more negative aspects of turnover. Bruce et al. (2009) state in their work that the average retention rate represents the number of specific hires in a given year who are still employed the following year divided by the number of initial hires.

Retention provides valuable insights to line managers and workforce planners, especially for highly skilled employees. Calculating retention rates alongside turnover rates offers a more comprehensive understanding of worker movement. This allows organizations to identify who is leaving and gain insights into the reasons for their departure and the true associated costs (Waldman & Arora, 2004).

Retention strategies have been explored in previous studies, including by large human resource management organizations such as the Society for Human Resource Management (SHRM). In these studies, the authors tend to align company policies with business strategies, implementing pre-selection screening criteria based on identified relationships, and documenting employee data for benchmarking future retention performance (Bruce et al., 2009). In their study, Albattah et al. (2017) identified job satisfaction as a fundamental factor influencing craft workers' retention and productivity. Other factors impacting the retention of construction workers, according to Harper et al. (2023) include: (a) strong leadership and management, (b) a welcoming atmosphere, (c) work-life balance, (d) location of work, and (e) challenging work assignments.

When taken together, these findings highlight that retaining skilled craft workers requires more than just good policy; it demands targeted training, clear advancement pathways, and supportive leadership.

Turnover

Turnover refers to the movement of employees out of an organization voluntarily or through termination by the employer (Waldman & Arora, 2004). Average turnover is the measure of the total number of voluntary leavers and terminations per year divided by the average active employees, or the rate of craft workers hired by a company/project to replace those who have left voluntarily in that period (Goodrum et al., 2007).

According to the study by Ayegba and Agbo (2014), the main factors responsible for craft worker turnover include: (a) poor payment and benefits, (b) poor treatment of workers, and (c) the absence of advancement and promotion opportunities. The authors further highlight the cost implications of turnover: direct costs (such as hiring and training new workers) and indirect costs (including project overtime, additional workload for retained craft workers, and reduced project performance).

Absenteeism

Absenteeism in construction refers to the frequency and duration of unscheduled worker absences from the jobsite, regardless of the underlying cause. It directly affects labor availability, productivity, and project timelines. According to Goodrum et al. (2007), absenteeism is typically measured as the rate at which

a worker misses scheduled work hours relative to the total hours they were expected to work.

High absenteeism in construction can stem from various factors, including job dissatisfaction, inadequate working conditions, lack of engagement, or physical strain. Extended or repeated absenteeism disrupts crew continuity, increases costs, and lowers overall project efficiency. Moreover, workers who are absent for long periods often face barriers when returning to the job, especially in high-skill or labor-intensive roles. Addressing absenteeism proactively through supportive policies, training, jobsite improvements, and communication strategies can significantly enhance workforce stability and project performance.

Ongoing training and upskilling initiatives could help reduce absenteeism by increasing job engagement, providing clear career progression, and easing reintegration for returning workers. By investing in training development and craft skills training, construction organizations might better retain their skilled labor, minimize project disruptions, and sustain productivity on complex projects.

Previous Studies on Craft Training Return on Investment

Simply put, ROI is a tool used to evaluate the ratio of benefits to cost over a period of time by dividing the net present benefits by the total net present costs. According to Glover et al. (1999) ROI is:

> *"…a measure of benefit versus cost. Expressed as a percentage, ROI is determined by total net present benefits divided by total net present costs. Benefits and costs are converted into present values since they usually accrue over extended periods of time."* (p. 1)

Benefits and costs are transformed into current values since they frequently occur over long periods. This makes it possible to fairly compare an investment's value relative to the initial capital (Glover et al., 1999).

ROI is crucial for aligning training initiatives with the performance objectives of construction firms within the industry. It provides a strategic and operational framework, like quality management practices, to assess the effectiveness and value of training systems. By measuring ROI, organizations can ensure that their training efforts contribute to overall construction project performance and provide value for the cost of training by employers in the construction industry (Cox & Issa, 1999).

In the CII study, Goodrum et al. (2007) affirmed that each dollar invested in craft training can yield $1.30 to $3.00 in benefit to the trainee, the employer, and the economy. This suggests that training fosters financial benefits. Another study, conducted to assess the ROI of craft training in the construction industry by Cox and Issa in 1999 collected quantitative and qualitative data from over 300 craft trainee respondents. Three economics-based models and two company case studies were developed to analyze ROI. The study examined craft trainees' perceptions of motivation, satisfaction, and commitment in terms of qualitative measures. The data indicated that (a) improved morale, (b) job satisfaction, and (c) increased productivity were some initial improvements realized from craft worker training.

Glover et al. (1999) used a theoretical baseline for the ROI from craft training and framed ROI from craft worker training as the value-added performance from the trainee. Within this study, the researchers used demographic data on training programs and craft trainees to calculate averages and analyze various factors such as: (a) estimated and actual work quantities, (b) duration, (c) planned unit cost, (d) productivity, and (e) unit cost changes. The percentage changes in actual and planned productivity and unit costs were reviewed and normalized to assess the impact of changes in work quantities and scope discrepancies. Their calculation shows that to achieve an 8% return on a $1,000 investment in craft training over two years, the worker needs to become 2.34% more effective. This result translates to being productive for just 11 more minutes per day over the following two years or six more minutes per day over the subsequent four years.

Additionally, the study utilized self-reported measures to calculate the improvement delta, representing the percentage change in productivity from pre-training to post-training for each training component. Their electrical contractor case study reported a 42% increase in productivity based on pre-and post-training measurement, a 22% increase in productivity based on planned versus actual performance, a 6% reduction in planned versus actual unit costs, and a 50% reduction in both absenteeism and turnover. Whereas their sprinkler fitter case study reported a 14% increase in productivity based on pre-and post-training measurement, a 22% increase in productivity based on 7% planned versus actual performance, an average of 29% reductions in turnover, and an average of 35% reductions in absenteeism.

Ramadan et al. (2023) surveyed 2,468 craft workers and frontline supervisors on the impact of workforce training on self-evaluated performance records using five parameters: (a) safety, (b) attendance, (c) productivity, (d) quality, and (e) initiative. Their analysis revealed that workforce training had a statistically significant effect on enhancing workers' performance, finding a strong positive correlation between craft worker training hours and average personal performance records.

Their findings suggest that individuals who had undergone technical skills training experienced notable improvements in their performance across the five parameters. The findings revealed that training programs targeting craft, job management, and planning skills positively affected workers' self-evaluated performance records. The study also concluded that by investing in technical skill training, organizations could: (a) effectively enhance the performance of their craft workers and frontline supervisors, (b) yield tremendous returns on construction projects, and (c) enhance the effectiveness of craft workers in their trades.

These findings underscore that investing in craft worker training not only delivers measurable returns in productivity, cost efficiency, and worker satisfaction but also plays a pivotal role in driving project success and sustaining a high-performing construction workforce.

Research Purpose and Questions

The purpose of this study is to evaluate the ROI of craft worker training programs within the construction industry, focusing on the impact of training quality and effectiveness on multiple key performance metrics.

By examining the relationships between formal and informal training methods and their influence on workforce performance, this study seeks to provide data-driven insights that can help organizations optimize training strategies, improve workforce competency, and enhance business performance. Additionally, this study aims to identify barriers to effective training and recommend best practices for maximizing the ROI of workforce development initiatives.

Ultimately, this study seeks to address the research purpose using the following primary and subsidiary research questions:

- What is the impact of structured craft worker training on key performance metrics such as (a) productivity, (b) safety, (c) quality, (d) retention, and (e) overall project performance within the construction industry?

To further explore the return on investment in construction workforce training, this study also addressed the following two subsidiary research questions:

- How do different training delivery methods (e.g., classroom training, OJT, CBT, self-paced learning) influence craft worker performance, satisfaction, and retention across various experience levels?
- What are the primary barriers and benefits to implementing effective training programs for craft workers?

Research Methodology

This study employed a mixed-methods research design to investigate the relationship between technical training quality and craft worker performance, drawing upon both quantitative and qualitative data collection strategies to provide a deeper more comprehensive perspective of the participants (Creswell & Plano Clark, 2017).

Specifically, researchers utilized several data collection tools: (a) a large-scale survey of craft workers, (b) focus group discussions with craft workers and supervisors, (c) a follow-up survey administered to construction companies to compare training investments with workforce outcomes and (d) a final survey that asked questions similar to those provided in the first two surveys. These tools were developed using methods developed from previous similar research methodologies (Ereiba et al., 2004; Krueger & Casey, 2014; Oppenheim, 1992).

Questions for these instruments were informed by prior research on workforce development and skill acquisition in the skilled trades and aligned with best practices for research on career trajectories in construction. Surveys utilized a variety of question types, Likert-scale questions that allowed participants to rank their agreement with questions as well as multiple-choice responses to measure trends and patterns across the participant pool. These question types were based on principles provided by Keppel (1991), Bridgmon and Martin (2013), and Williams et al. (2022).

To complement the survey data and explore participants' perceptions of training efficacy in greater depth, three focus groups were conducted: one virtually and two in person. These discussions included apprentices, journey-level craft workers, and supervisors, capturing cross-sectional insights into training quality and field performance.

A third data collection phase involved a targeted company survey, disseminated by NCCER and their associated researcher networks, which gathered organizational-level data on training practices, workforce composition, and observed impacts on productivity, rework, and performance benchmarks.

Data analysis was conducted using a two-pronged approach. Quantitative data was analyzed using descriptive statistics to identify key trends, such as the prevalence of support programs, the impact of mentorship opportunities, and perceptions of workplace culture based on principles of analysis provided by Bridgmon and Martin (2013), and Williams et al. (2022). Thematic analysis (Saldaña, 2021) was applied to qualitative data to identify recurring themes, patterns, and unique perspectives that further developed the study's findings.

Craft Worker Survey

The craft worker questionnaire was piloted through NCCER members for review and feedback. The final copy of the craft worker survey questionnaire was developed in Qualtrics and administered electronically by sending the survey link to NCCER contractors.

A total of 1,468 questionnaires were completed by craft workers across four industry sectors: industrial, commercial, residential, and heavy/civil. The majority of responses came from the industrial sector. After reviewing the responses, 543 (37%) were deemed useful for this study, as these responses represented craft workers across a variety of trades with zero to eight years of craft experience (e.g., early career craft workers).

Focus Groups

To gain more insights into the quality of technical skills training received by the population, the study utilized three focus group discussions, with one focus group conducted virtually and two conducted in person, with craft workers located in Texas, Louisiana, and Colorado. The attendees included craft workers with varying experience and training, along with supervisors.

The focus group discussion with construction craft workers in Texas was conducted online in May 2023 and lasted one hour. This focus group discussion included three electrical apprentices, one supervisor, and one superintendent. A second focus group discussion occurred in July, in person, in Louisiana, with four participants: one sheet metal worker, two electricians in training, and one supervisor. The craft workers in this focus group had only one to two years of experience in their trades. A third focus group discussion took place in July 2023 in Colorado. The participants included eight early career apprentices and helpers and one journey-level craft worker.

2023 NCCER Survey

To further understand the data from the craft worker survey and the focus group discussions, a second survey was developed, geared towards construction companies and supervisors of craft workers. This 2023 survey was designed to collect information based on whether a company provided training to craft workers or did not fund and provide training to craft workers.

The data included: (a) the percent of employed craft workers who were apprentices, helpers, or laborers, (b) the percentage of rework performed, (c) the percentage of time that a project achieves productivity estimates, (d) the proficiency level of craft workers at early career and journey-level positions, and (e) observations of performance improvements once a craft worker completed training or if the craft worker was employed by a company that did not provide training, then observing performance improvements once a craft worker had gained field experience.

The survey was distributed to a wide variety of construction organizations and relied on the contact network of the research team and NCCER. A total of 137 responses were collected, with 116 representing companies that provide training to their craft workers and 21 representing companies that do not provide training to their craft workers.

2024 NCCER Survey

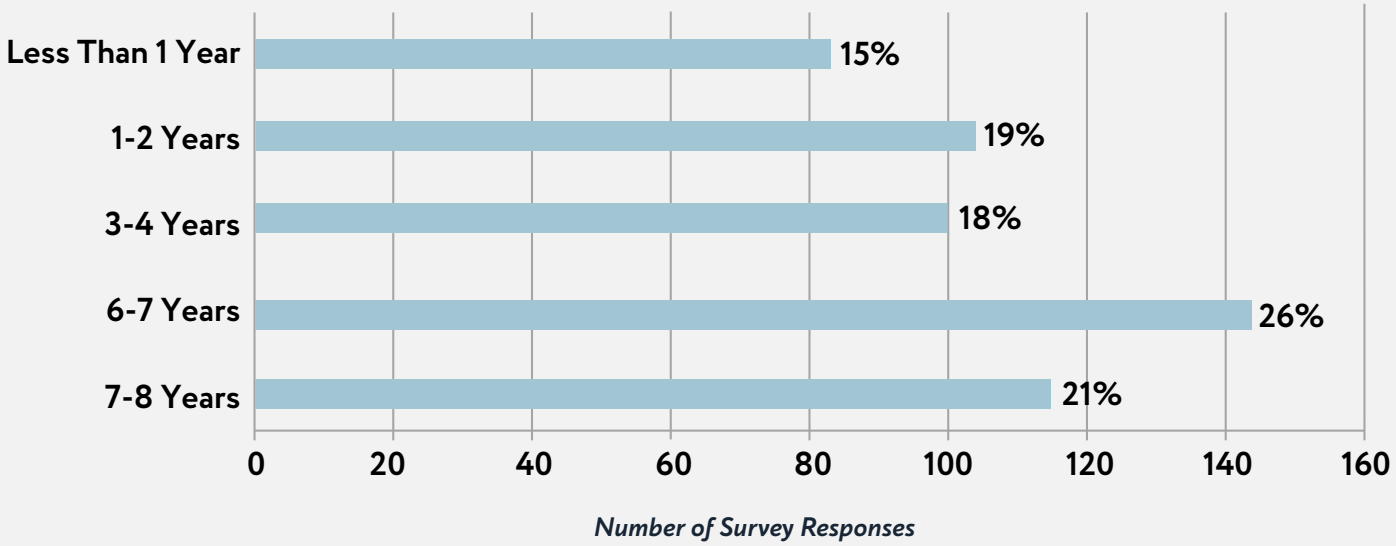
To further verify and understand the data from the initial craft worker survey, the focus group discussions, and the second survey, a third questionnaire was developed, geared towards construction companies and leaders within construction companies that train and employ craft workers.

This survey was designed to evaluate the ROI of formal technical skills craft training programs across the construction industry. Conducted by NCCER, the study collected responses from nearly 200 industry stakeholders to better understand how companies invest in, implement, and measure the impact of craft training. It focused specifically on structured training that follows a defined curriculum to prepare unskilled workers for skilled trade careers. The survey explored training formats, completion rates, costs, barriers, speed to productivity, and the financial impact of training on business outcomes. Its intent was to gather meaningful, organization-level data to support a data-driven case for the value of craft training and to identify best practices that enhance workforce development efforts across the industry.

NCCER conducted this survey from October 2025 to February 2025. The survey received 193 complete responses, with 170 companies (88%) reporting that they directly hire craft workers and 91 companies (47%) confirming they provide and financially support structured craft training programs. These programs follow defined curricula and are aimed at preparing unskilled workers for skilled trades. Respondents represented a wide range of industry sectors and geographic regions throughout the United States. Among the 51 organizations that detailed their training methods, most reported using blended formats that combine classroom learning, on-the-job training (OJT), and third-party providers. While 44 companies had expanded or initiated training based on measurable outcomes, only 43 had formally assessed the financial impact of their programs.

FIGURE 4

Years of Experience for Craft Workers Responding to the Survey



RESULTS AND FINDINGS

The information collected and analyzed from the craft worker surveys, focus group discussions, and company surveys are summarized in this section.

Early Career Construction Craft Workers

There were 543 respondents to the Craft Worker Survey, and their level of experience ranged from zero to eight years. The distribution across the five experience categories used in this study is presented in Figure 4.

The Craft Worker Survey respondents were also asked to provide their craft affiliation. The results showed that craft worker respondents represent 32 different crafts, with boilermakers, pipefitters, scaffolders, welders, and

FIGURE 5

Craft Worker Survey Participant Affiliations

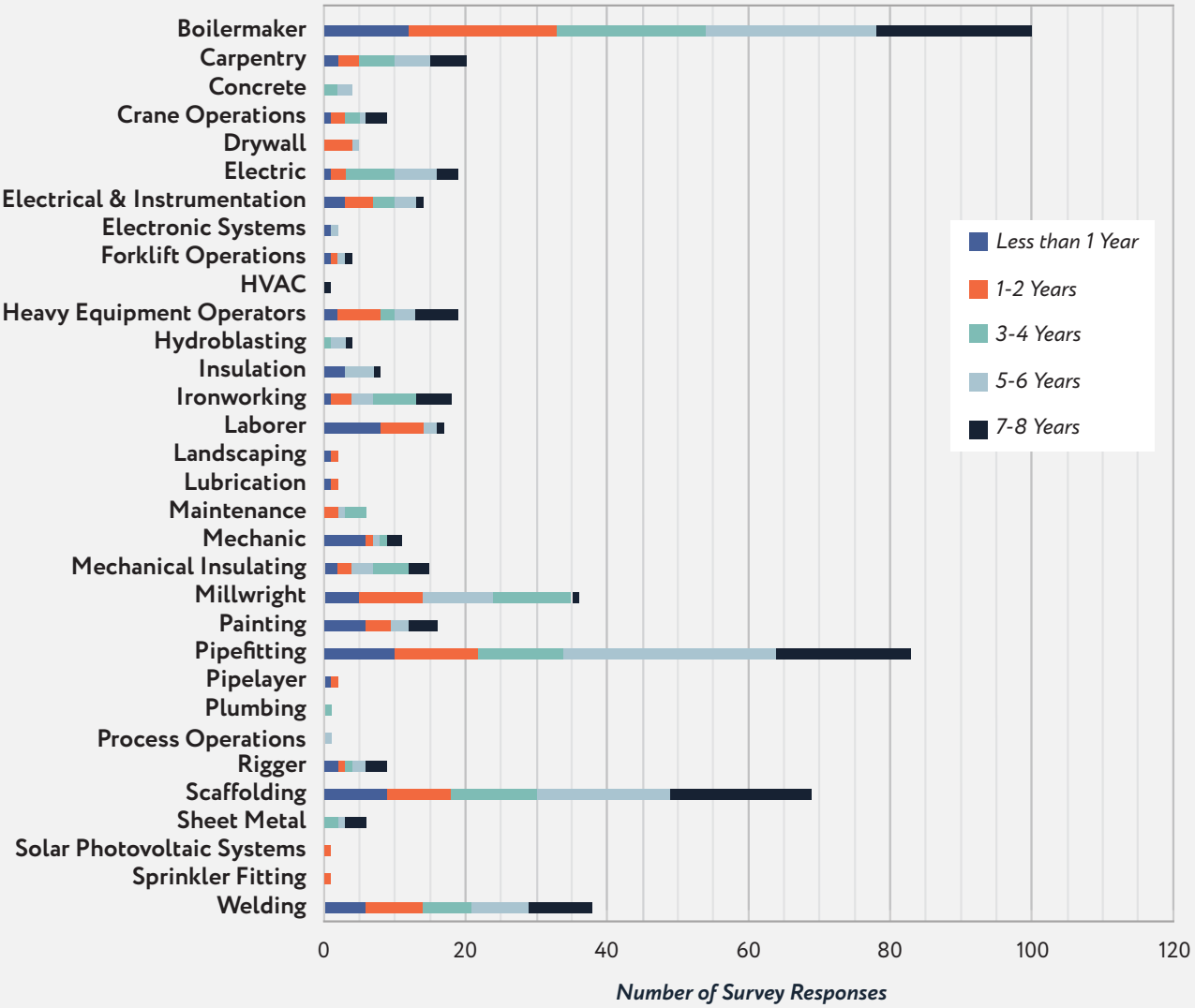
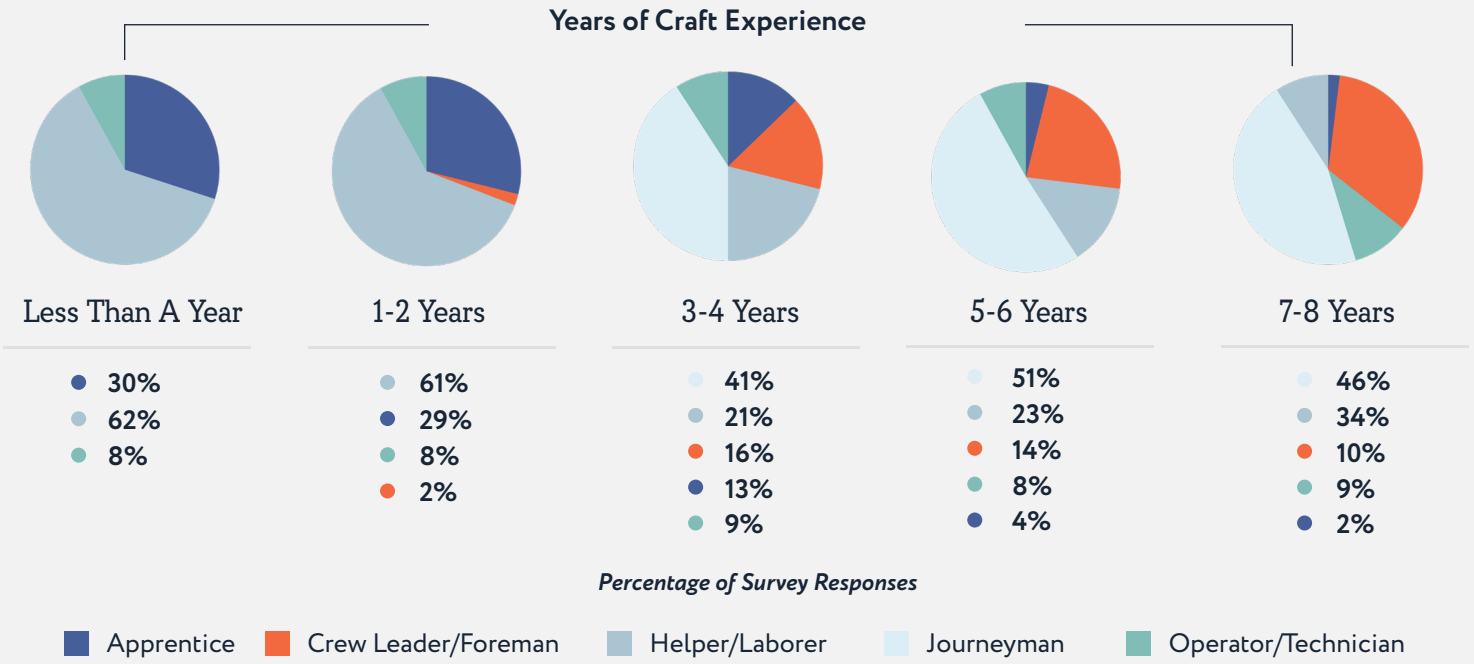


FIGURE 6

Current Role of Craft Workers



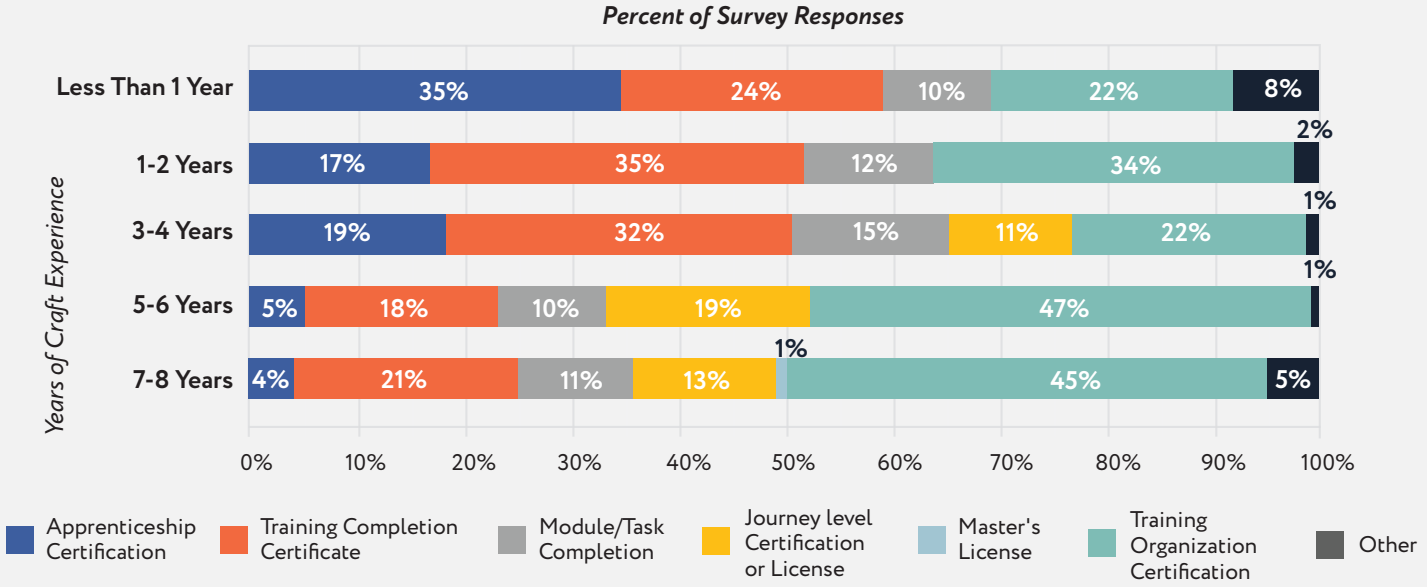
millwrights representing 54.1% of the responses (See Figure 5). In addition, the current role each craft worker holds in the industry was collected. Figure 6 outlines the results from the survey. In reviewing the five categories of craft worker experience, apprentices (30%), helpers/laborers (62%), and operators/technicians (8%) represent all survey responses with less than one year of craft experience.

Craft workers with one to two years of experience show similar results to those with less than one year of experience, with a small percentage in supervisory positions (2%). This can lead to the assumption that there is a lack of experienced supervisors in the industry, and, therefore, fewer experienced craft workers are being put into supervisor roles, or the top young craft workers are gaining promotions early in their careers. Still, there are more journey-level craft workers with three to eight years' experience in the supervisor role most likely due to their gaining training and experience as their careers progress.

In addition to experience and roles, the survey also asked about credentials and certifications. According to the results, craft workers hold different certifications, as illustrated in Figure 7, and the number and types vary across the five craft worker experience categories. The data show that for participants in the less than 1 year of experience category, the majority of participants hold an apprentice certificate (35%), completed a training module (24%), or obtained a national training organization credential from organizations such as NCCER (22%). The data also show that credentials or certification from a national training organization increase as a craft worker gains more experience. Furthermore, apprentice certifications decrease as the experience increases, while journey-level certifications or licenses increase as experience increases. The other category includes craft workers with commercial driver's licenses (CDL), forklift certifications, non-destructive testing (NDT) certifications, and other specialty certifications.

FIGURE 7

Craft Workers' Credentials and Certifications



The data also show that 58% of the craft workers with less than 1 year of experience hold at least one certificate or training credential, and 85% of craft workers with 7-8 years of experience hold at least one credential. This implies that the use of training organizations to gain certification increases as a craft worker gains experience. A focus group participant emphasized the importance of training and certification for experienced and inexperienced craft workers alike by saying:

> *"When you give someone a certification, it makes them motivated to learn. They can see that they have something to work towards. Getting trained towards getting a license or certification helps people get better prepared for other parts of work. You learn many things from doing the certification. It can help build pride in your work".*

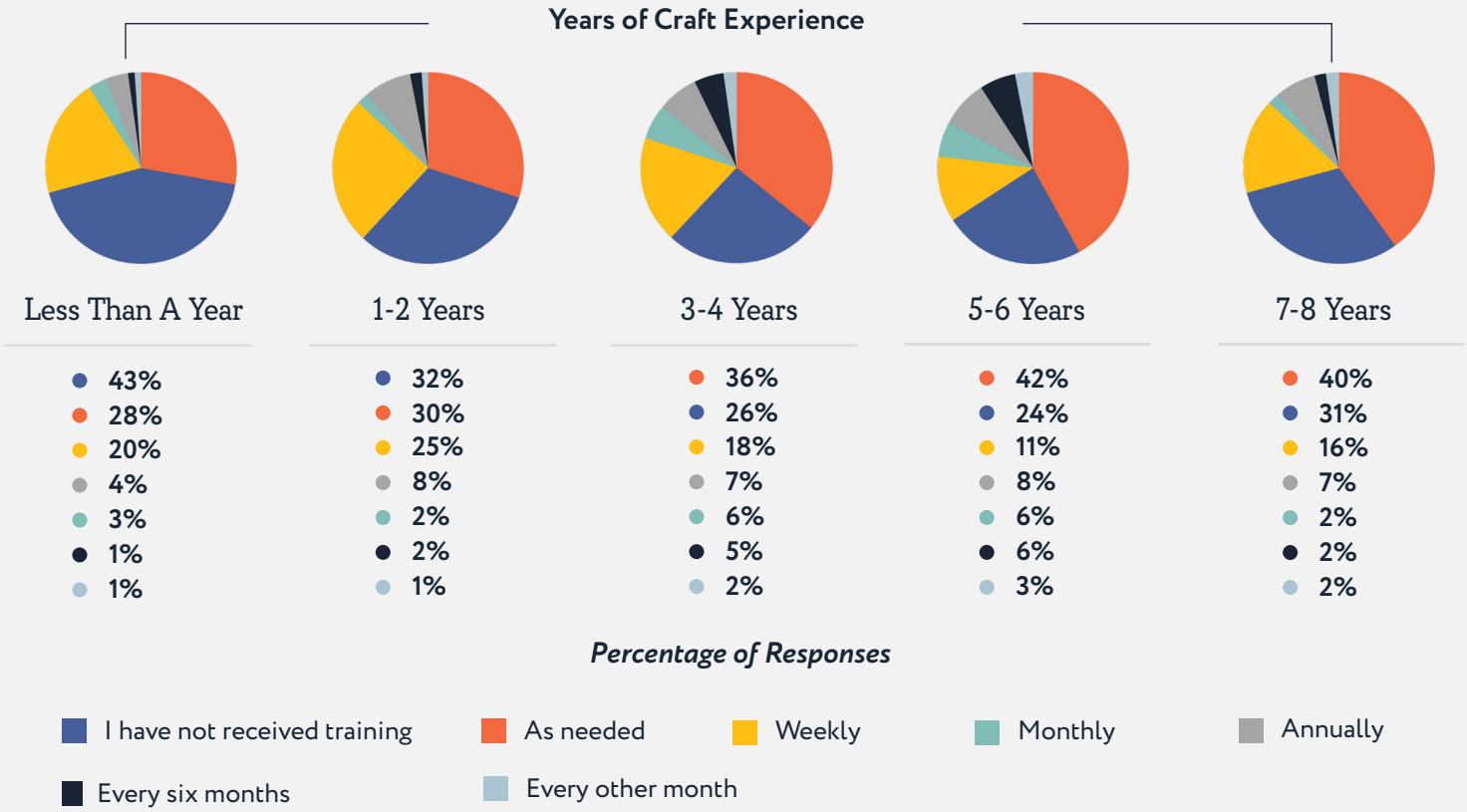
Craft Worker Training

Technical skills training refers to the training used to teach a craft worker how to perform their craft-specific responsibilities for construction work. Without training and experience, craft workers cannot develop the essential knowledge and skills to perform their work. To understand the state of training for craft workers, the Craft Worker Survey collected the frequency of craft workers receiving technical skills training.

Figure 8 shows that across all experience categories, the "As needed" response and "I have not received technical skills training" were the most frequently selected responses. Notably, the "As needed" response far outstrips the responses representing regular intervals such as weekly, monthly, or annually. This could be due to the varying nature of training delivery and the just-in-time nature of some training needs. Notably, 43% of respondents with less than one year of experience reported not receiving technical skills training—likely because they are still developing basic skills. This may also reflect a common perception among craft workers that only structured, classroom-based instruction qualifies as "training," while on-the-job learning is not recognized as such. In contrast, studies show that over 70% of learning and training

FIGURE 8

Craft Technical Skills Training Frequency



in the workplace occurs informally (Baldwin & Ford, 1988), with 90% of competency in skills acquisition happening informally (Tannenbaum et al., 2010). According to these and other studies, informal training is an intentional process of transferring learning among workers, training outside the formal classroom, self-directed, knowledge sharing between employees, experiential learning, informal field-based learning, and continuous learning (Beier & Kanfer, 2009; Tannenbaum & Wolfson, 2022; Wolfson et al., 2018).

An example of these findings is found in a focus group participant's comment, confirming that most of what they do is "trial and error" when training is not formally provided.

> *"For me, it is trial and error to do something. I figured out the best way of doing it. Perhaps with training, I could learn to do it more efficiently".*

While Beier and Kanfer (2009) identified learning through trial and error as experiential learning (informal), Noe et al. (2013) emphasized complementing experiential learning with formal learning. Craft workers in our focus groups attested to the difficulty of figuring things out on-site due to a lack of technical skills training. These findings were echoed in other survey data presented in the Training and Retention section later in this document.

Technical Skills Training

To train craft workers, various types of technical skills training delivery methods are used. Training for craft workers can be delivered as formal OJT (scheduled and organized approach), informal OJT (job shadowing and working with various trainers), instructor-led classroom training, instructor-led hands-on applications, instructor-led online training, and self-paced learning.

FIGURE 9

Technical Skills Training Types for Craft Workers

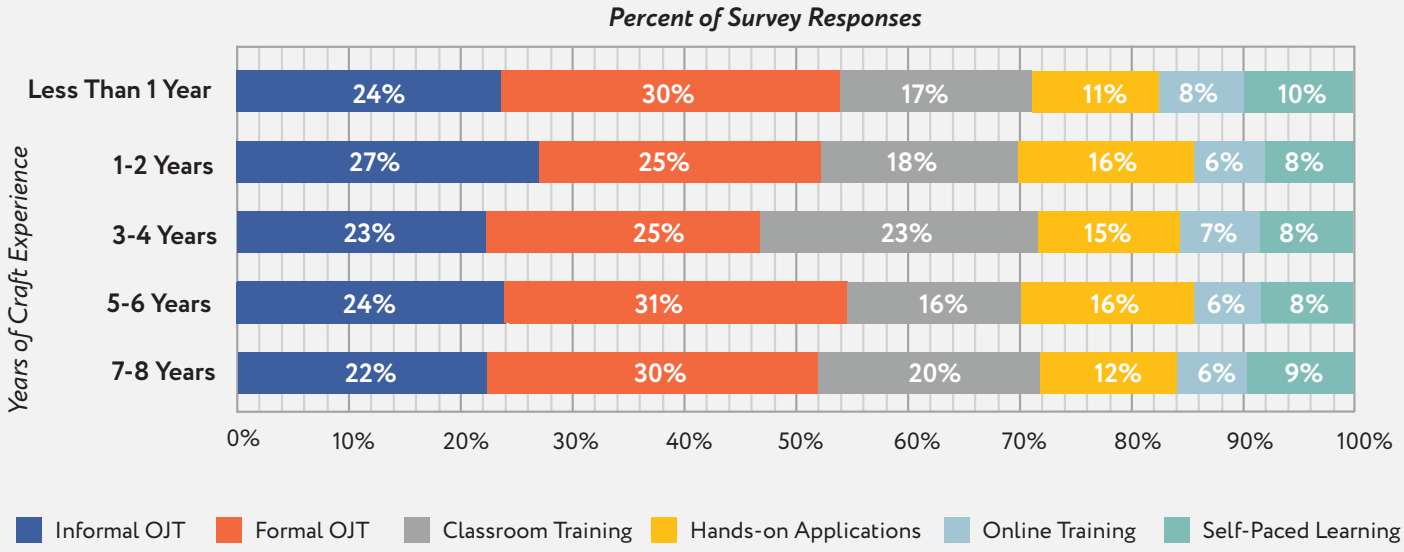


Figure 9 outlines the types of technical skills training craft workers with zero to eight years' experience complete, according to the Craft Worker Survey participants.

Most technical skills training occurs in the field with formal OJT where training is scheduled at the site. This represents 25% to 30% of all training for each experience category. Informal OJT represents 22% to 27% of the responses for each experience category. When combined, information and formal, OJT is used about 50% of the time for training craft workers, regardless of the years of experience a craft worker possesses.

Online training is the least used, with only 6% to 8% of craft workers responding to this option. While online training may not accomplish all the training needed for craft workers, benefits exist in using online training, such as lower costs, no travel required, and the ability to meet with a larger audience.

While online training was the least mentioned by respondents in each experience category, a focus group participant confirmed that online technical skill training has allowed him to receive training more conveniently. In contrast, another craft worker in the focus groups emphasized the challenge of studying after a long stressful day is the main disadvantage of on-line technical skills training:

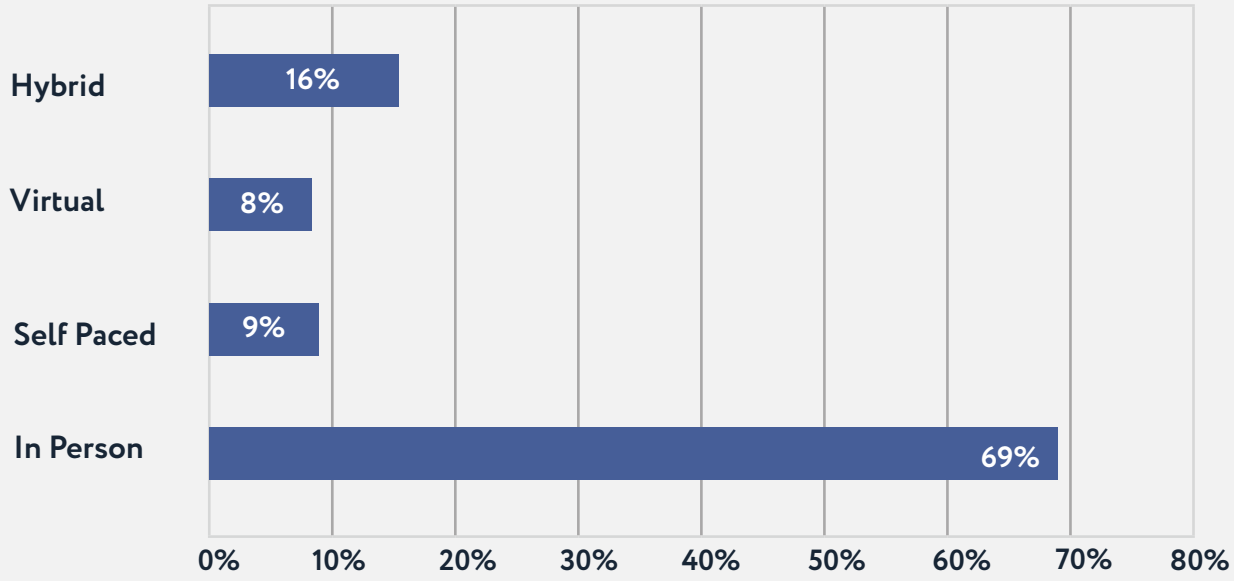
> *"You're in the zone after a long hard day at work, and I've got another four hours of class on my computer just something pretty stressful."*

The survey data from NCCER's 2024 survey supports this relationship. This survey shows that while many companies are exploring digital delivery methods for craft worker training, such as virtual platforms and self-paced online courses, traditional in-person instruction remains dominant across the industry for all craft skills. Figure 10 shows that for all companies that invest in training across multiple craft areas, 69% of training is delivered in person, far outpacing hybrid (14%), self-paced online (9%), and virtual instructor-led (8%) methods.

This finding suggests that despite technological advancements, organizations still rely heavily on hands-on, instructor-led learning, likely due to the physical, skills-based nature of many craft roles.

FIGURE 10

Primary Delivery Methods for Craft Worker Training Across Organizations



However, the growing presence of hybrid models reflects a shift toward integrating digital flexibility without sacrificing in-person effectiveness. These results support the report's broader conclusion: that investment in training is most effective when tailored to the realities of the work environment, and for many crafts, that environment still demands face-to-face instruction.

The various types of technical skills training were rated by craft worker survey respondents on a five-point Likert scale based on the level of helpfulness of each type of technical skills training they have received. Figure 11 summarizes the different types of technical skills training and includes the mean ratings provided by the survey respondents across the five experience categories. The results show that all training types for all experience categories are 4.0 and above, which correlates to the "Very Helpful" rating, illustrating that each form of craft technical skills training provides value to craft workers to learn their trade. The responding craft workers rated informal OJT as very helpful, with ratings between 4.19 and 4.28, which corresponds with previous research that over 70% of learning and training occur informally, with 90% of competency in skills acquisition happening informally at the workplace (Baldwin & Ford, 1988; Tannenbaum et al., 2010).

Training Components

Craft training includes components such as the instructor, textbook, examples, hands-on applications, exams/assessments, learning technologies, and virtual digital technologies (e.g., virtual reality/augmented reality (VR/AR)) for training. Figure 12 provides the mean helpfulness rating for each component rated by Craft Worker Survey respondents on a five-point Likert scale.

The results illustrate that hands-on applications are consistently rated as the most helpful training component across all five craft worker experience categories. This trend indicates a strong preference for experiential, tactile learning methods among craft professionals. In each experience group, hands-on

FIGURE 11

Helpfulness Rating of Technical Skills Training Types for Craft Workers by Experience

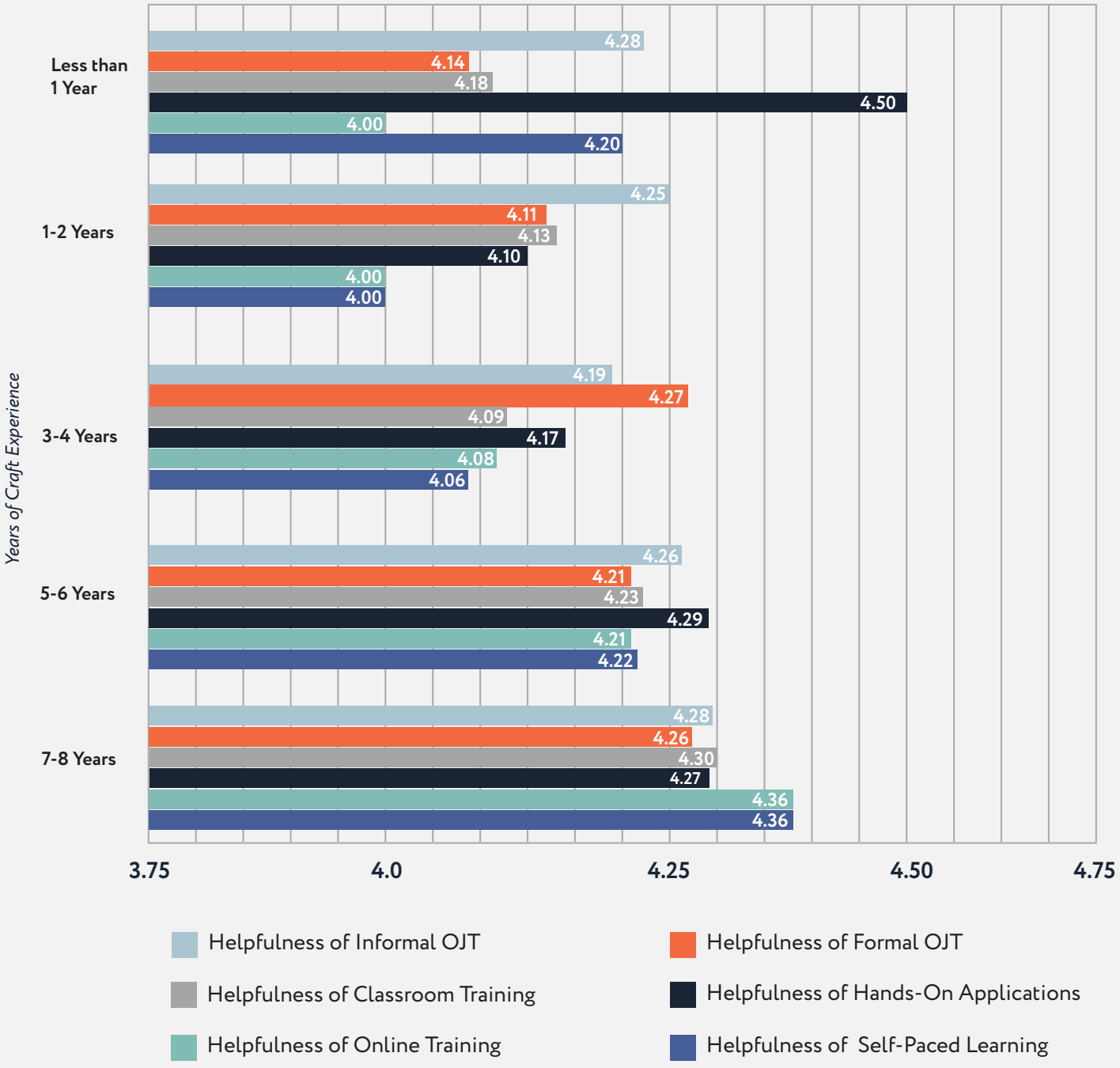
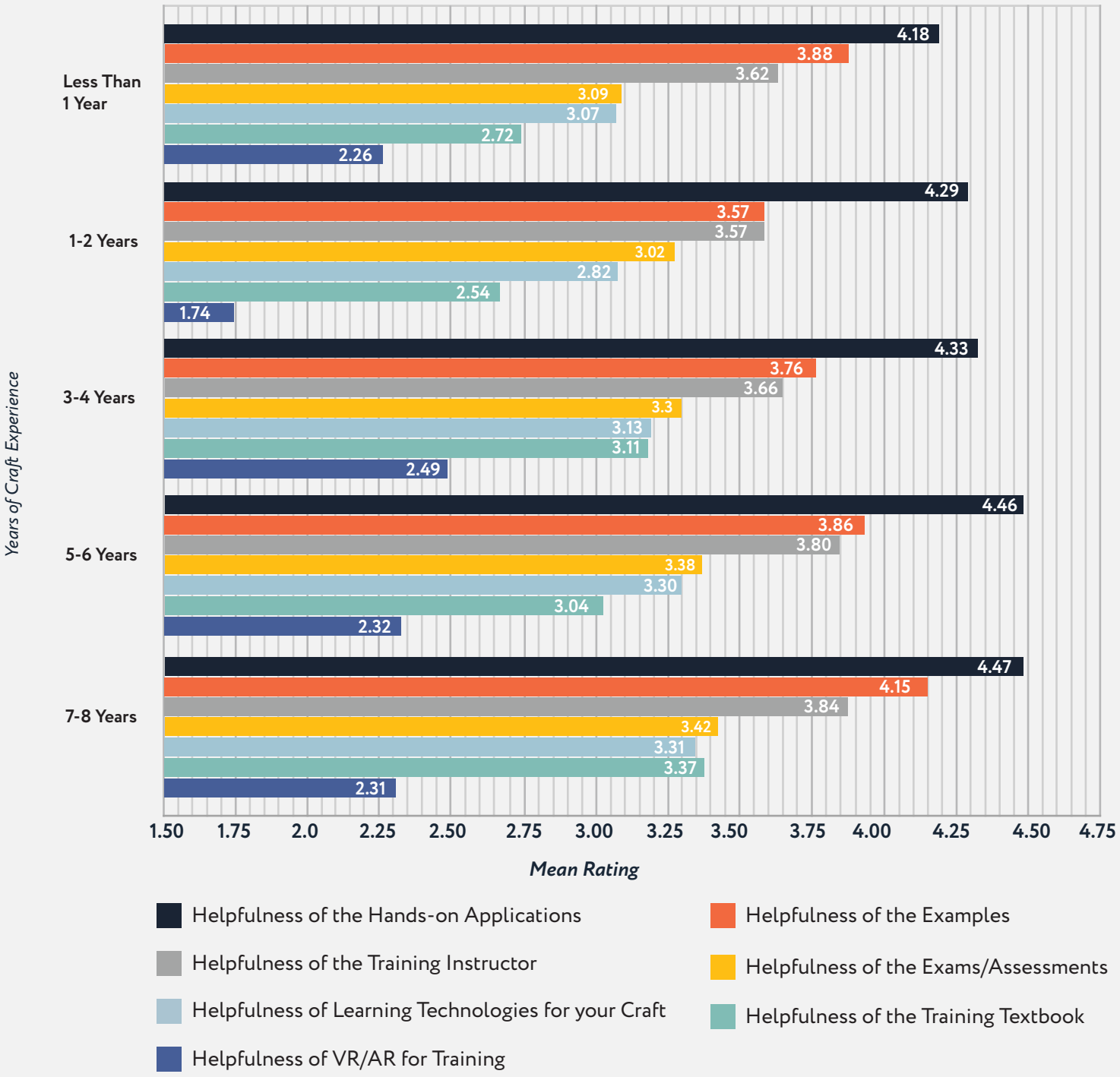


FIGURE 12

Helpfulness of Technical Skills Training Components for Craft Workers by Experience



training received the highest mean rating, suggesting that craft workers value the opportunity to see and practice tasks with direct guidance.

This preference supports the idea that visual and kinesthetic learning methods play a key role in skill acquisition and retention in the trades. By contrast, components such as the instructor, training textbook, exams, and learning technologies were generally rated as "Somewhat Helpful," a pattern that aligns with insights gathered from focus group participants.

Several participants in the focus group discussions mentioned that textbooks need to be more specific to their trades and responsibilities. One focus group participant mentioned:

> *"In terms of the book, if I have to memorize something in order to pass the test, that is not helping me learn."*

In addition, the craft workers who participated in the focus groups emphasized the need for the craft instructor to be "certified and caring."

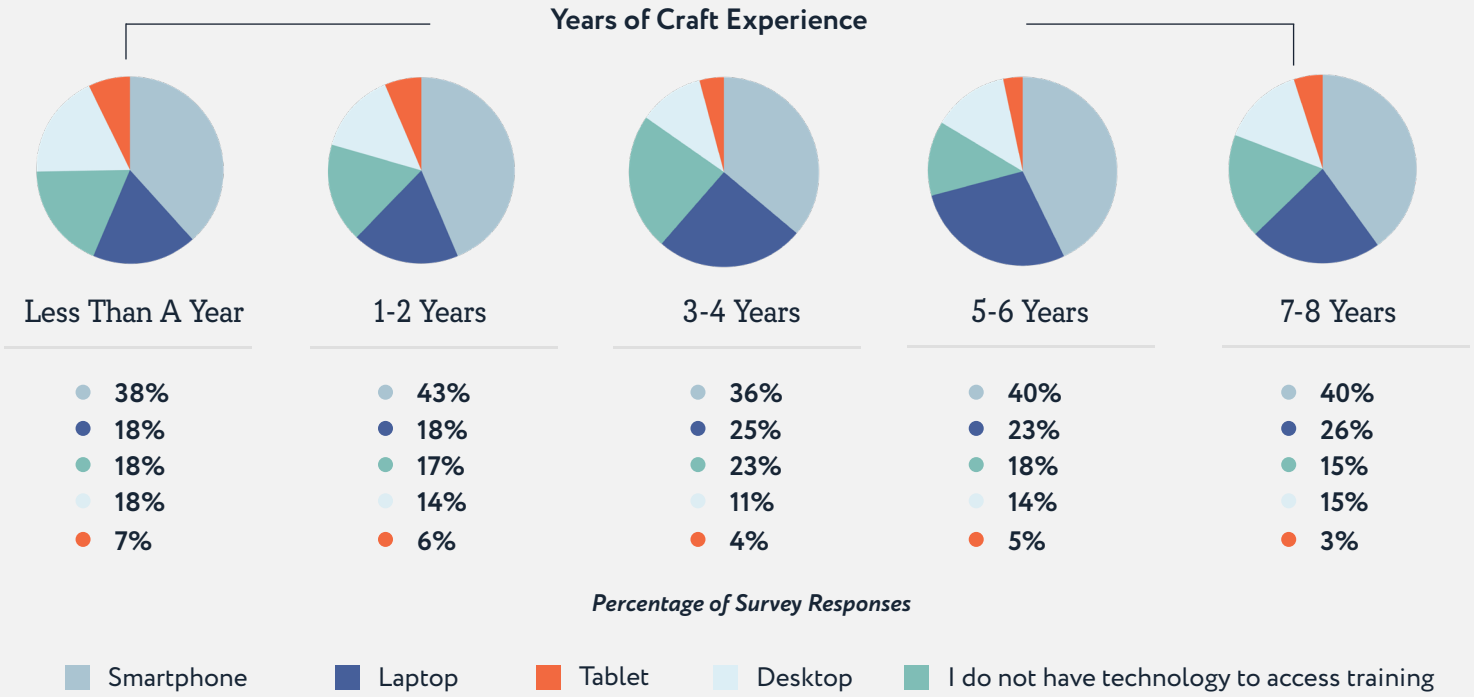
Training Delivery Technologies

Craft workers were asked to provide the various types of technologies they use to access training and materials. The results are shown in Figure 13. About 40% of the survey responses for each experience category use a smartphone to access training. Laptops, tablets, and desktops are also used. A small percentage of craft workers with less than one year of experience do not have any technology to access training (7%).

The percentage of craft workers without access to technology for training reduces as a craft worker gains experience. This may mean that as a craft worker gains experience, they have more options to use

FIGURE 13

Types of Technologies Used to Access Training by Craft Workers by Experience



technologies for training. Of the 543 responses from craft workers with one to two years of experience, 6% do not have any technologies for training.

Who Pays for Training

A significant aspect of technical skills training is the cost and who pays for it. Figure 14 shows that about half of the responses in each experience category noted that their company pays for training. Also, 11% to 25% of responses stated that they pay a percentage of the training, and their company pays the rest. Therefore, most responses noted that their organizations assist with paying for training.

23% of respondents with less than one year of experience pay for training. This could be a detriment to a new craft worker who is not making the same wages as their experienced counterpart and is using money out of their own pocket to improve their skills. This situation may discourage craft workers when starting out in the industry, driving them away from construction. Previous research points out that the main factors responsible for craft worker turnover include poor payment and benefits, poor treatment of workers, lack of tuition reimbursement, the absence of advancement and promotion opportunities, lack of challenging work, and enormous workload (Ayegba & Agbo, 2014; & Harper et al. 2023; Goodrum et al., 2007).

One of the focus group participants attributed the inability to sponsor craft workers' training to low bids.

> *"Everything now is short-term, and we got the project on a very low bid, so the company has no money to sponsor craft workers' training, and there is no time to even teach the craft workers on-the-job due to time constraints on the project."*

Training and Retention

The importance of training craft workers, especially by employers, cannot be overemphasized. Figure 15 shows that the top two benefits to craft workers in all five experience categories are "I will improve the quality of

FIGURE 14

Paying for Training for Craft Workers

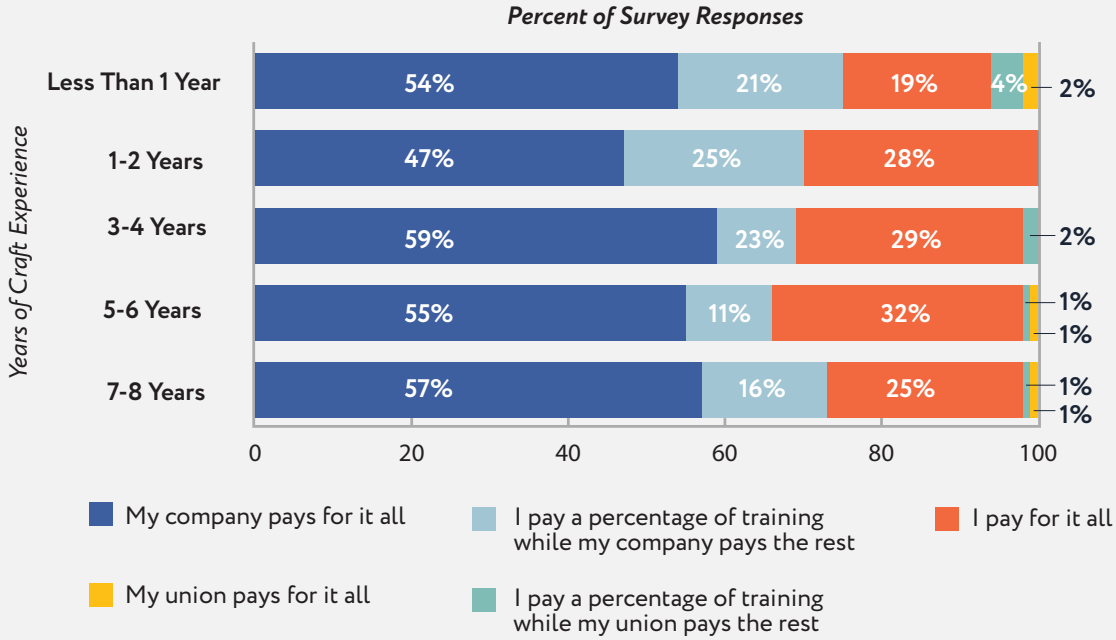
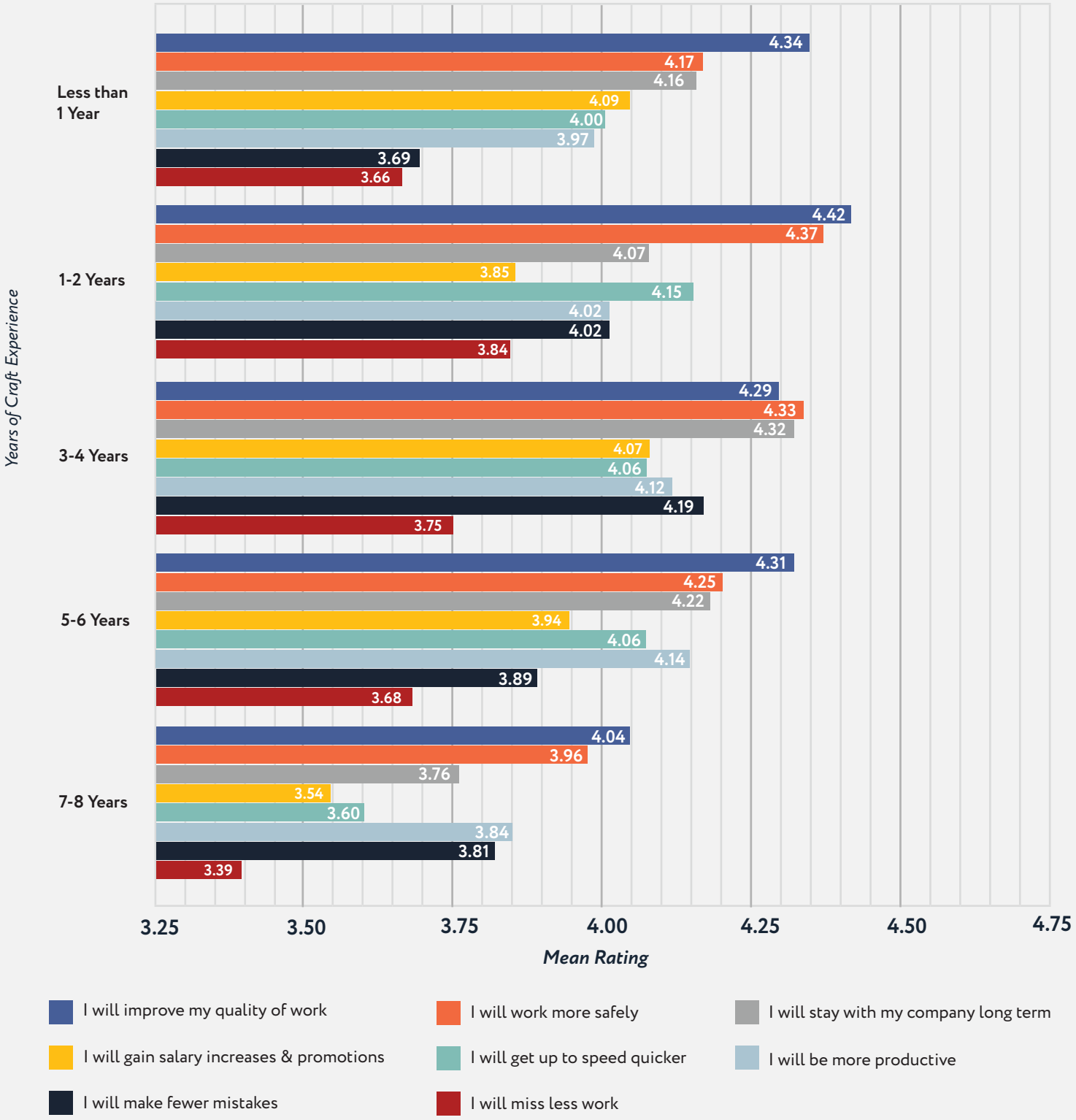


FIGURE 15

Impact on Craft Workers Receiving Training



my work" and "I will work more safely," which is further emphasizes the importance of technical skills training for a craft worker in terms of how they produce the work and perform work safely.

Interestingly, among he top benefits for craft workers with zero to six years of experience is "I will stay with my company long term." This finding is important, as knowing a craft worker shortage exists, having loyal employees would help reduce turnover.

A craft worker responded to this question during a focus group discussion by saying:

> *"I left a company because there were no training opportunities."*

Another focus group participant said:

> *"Even if the pay is low, I would rather stay in a company that provides me training opportunities."*

Technical skill training helps craft workers understand the processes involved in their craft, and therefore, they make fewer mistakes. One focus group participant mentioned:

> *"If you are doing something new, it would be a big help to be trained in how to do it before you went out there. It would help you know what you are doing".*

"I will stay with my company long term" is rated at a 3.76 (sometimes category), and "I will gain salary increases and promotions" is rated as 3.54 for those craft workers with 7-8 years' experience. This rating could be seen as concerning, as once craft workers have been trained and have gained experience, these individuals become more valuable to a company. However, if companies are not providing training to more experienced craft workers and training is not tied to salary increases or promotions, then companies may see increased turnover from their more experienced craft workers. Previous research illustrated that the greater the training investment, the higher the wage, the higher the ROI, and the greater the benefits accrued to the employer and the craft trainee, and the quality of a project will be enhanced (Cox and Issa, 1999; Goodrum et al., 2007).

However, higher job satisfaction among employees, training methods, relationship with management, use of advanced technologies, and individual craft worker perceptions or value for work can lead to reduced absenteeism and turnover rates (Goodrum et al., 2003; Halvorsen, 2005; Ramadan et al., 2023; Yang, 2010).

Barriers to Training

While training is widely recognized as important, underlying barriers still make it difficult for craft workers in the construction industry to attend or recognize training opportunities. In reviewing Figure 16, craft workers with zero to four years of experience most frequently cited "Training is not available" as the top barrier. Given the noticeable return in perceived value among those who do participate in training, companies should make stronger efforts to provide and clearly communicate available training opportunities to new workers.

In addition, some focus group participants raised concerns about training not being offered or conflicting with their work schedule.

> *"Training is not offered at convenient times, you got to travel, take time off of work, anything like that kind of impedes you from getting to training …but the people that we usually nominate for training are the high performers on the project so it always hurts a little bit to send those a lot of times, there's never a good time to actually move a guy for a week or two weeks or three weeks."*

Statements like these may imply that some employers only focus on training high-performing craft workers. Giving equal chances for craft workers to obtain training should be a focus of organization that want to continue to develop and retain their experienced workers.

Other challenges, such as time constraints, heavy workloads, limited budgets, and a workforce spread across different locations, make attending formal classroom training difficult for employees. Even when employees manage to participate in such programs,

their job responsibilities often prevent them from dedicating the necessary energy and focus required for effective learning (Noe et al., 2013).

Furthermore, our study results tend to show that the top training barrier for craft workers with five to eight years of experience is that "Training does not lead to salary increases or promotion." Again, a concerning finding is that as craft workers gain experience, they expect to move up the career path and gain better pay as their performance improves. Based on the results of this study, training is seen as a key to obtaining promotions. Additionally, those craft workers with more experience have the potential to move into supervisory roles, but if training is not tied to moving into management, that discourages craft workers from continuing to work in their trade. One focus group participant emphasized this by affirming:

> *"I would rather leave a company that does not provide career advancement through training."*

Overall, the results from Figure 16A and 16B show that it is important to provide access to training to attract and retain new hires to the industry. However, training needs to be tied to salary increases and promotions to keep these individuals long-term.

Figure 16 A

Barriers that Prevent Craft Workers from Attend Training

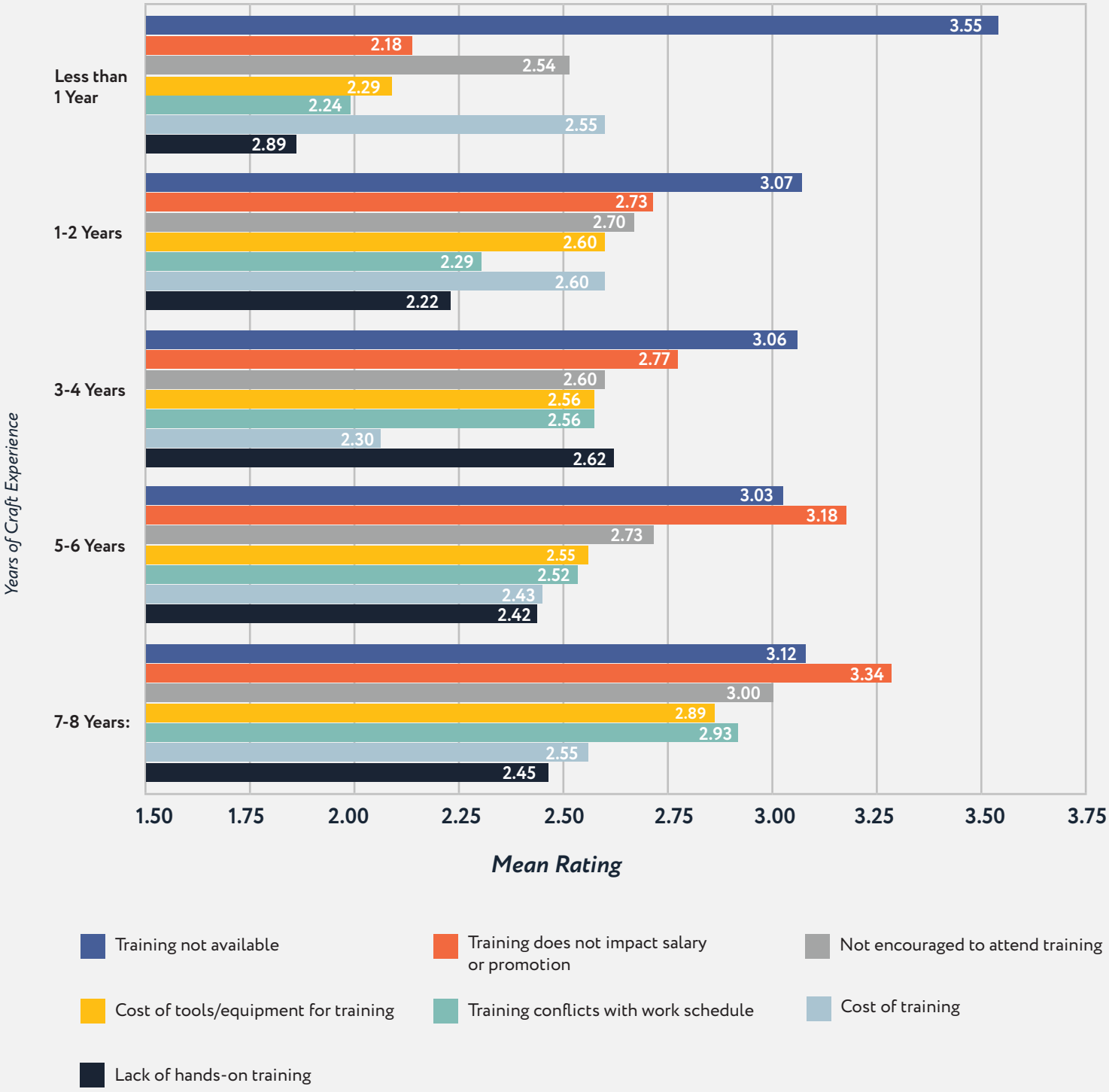
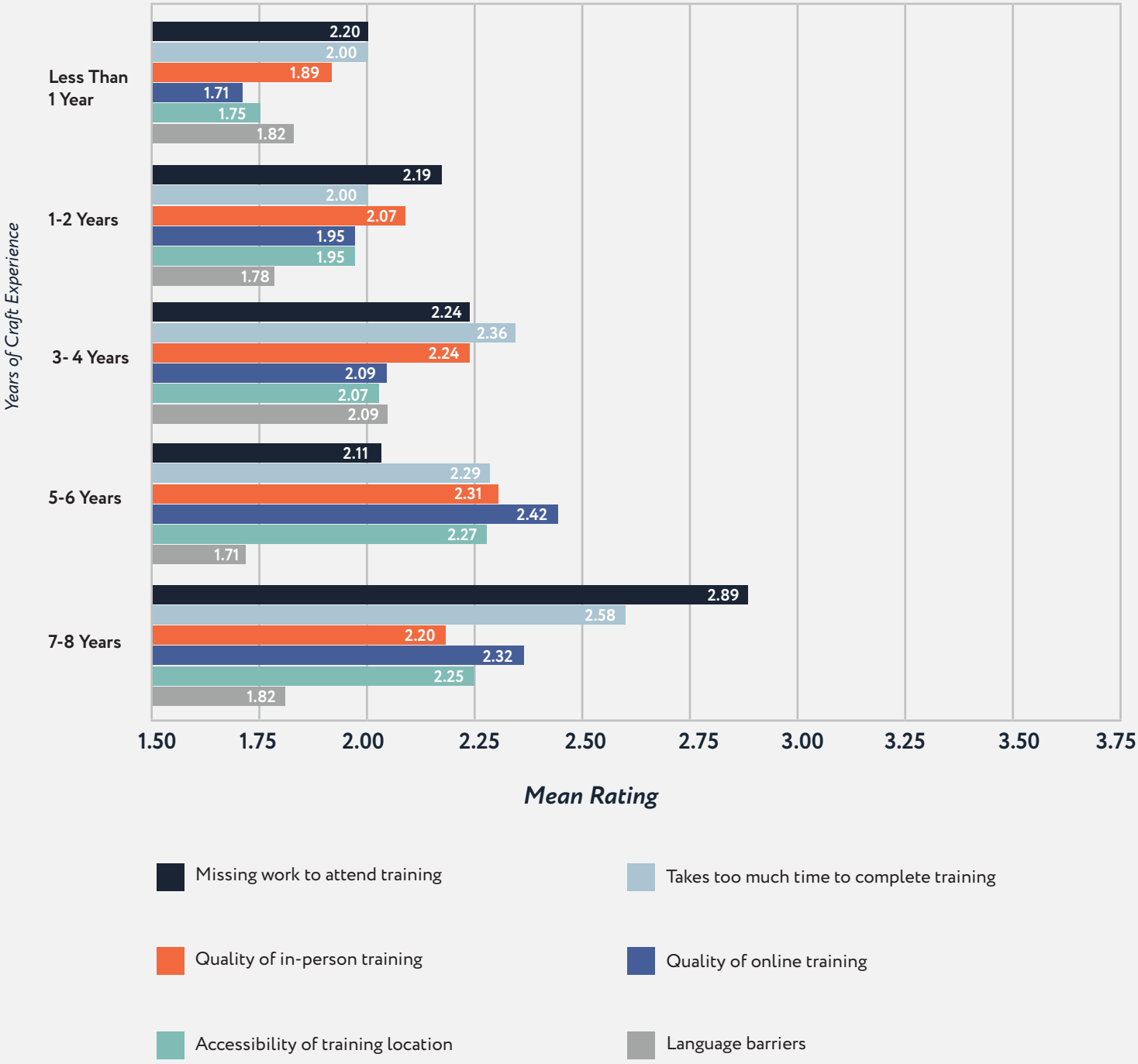


Figure 16 B

Barriers that Prevent Craft Workers from Attend Training (Continued)



Performance Impacts of Training Construction Craft Workers

Productivity and Training

The 2023 NCCER survey, provided to construction companies collected data using a survey questionnaire geared towards companies that provide training and companies that do not provide training for construction craft workers. Reasons that companies do not provide training were not collected in the survey. Table 1 shows the average amount of time a company achieves its productivity estimates for its projects based on whether or not it provides training. The impact of training can be seen in the results, as companies that provide training achieve productivity estimates about two-thirds of the time, while companies that do not provide training achieve productivity estimates a little more than 50% of the time.

Table 1

The Average Percentage of Time Companies Achieve Labor Productivity Estimates for Projects

	N	Mean	Median	Std Dev.
Companies providing craft worker training	108	65.36%	70.00%	21.38%
Companies not providing craft worker training	18	52.72%	55.00%	18.01%

Rework and Training

This 2023 NCCER survey collected information on how often craft workers perform rework on a project. Table 2 outlines the results, which shows that while the difference between companies that provide and those that do not provide training is small, companies providing training have craft workers performing rework less often (18.9%) than companies that do not (21.8%). Less rework means lower labor costs, fewer possibilities of delays occurring, and improved quality.

Table 2

The Average Percentage of Time Craft Workers are Performing Rework on a Project

	N	Mean	Median	Std Dev.
Companies providing craft worker training	108	18.86%	10.00%	19.26%
Companies not providing craft worker training	18	21.83%	15.00%	21.89%

Proficiency and Training

Companies were asked to provide their perceived level of proficiency for their apprentices, helpers, and laborers, typically early-career craft workers who require more training than experienced craft workers. Figure 17 shows that companies providing training to craft workers fall in the average proficiency level, while companies not providing training rated their early career craft workers at the below-average proficiency level. This evidence shows the importance of not only gaining experience, but also being trained early and often for early career craft workers.

FIGURE 17

Technical Skills Proficiency Ratings for Apprentices, Helpers, Laborers

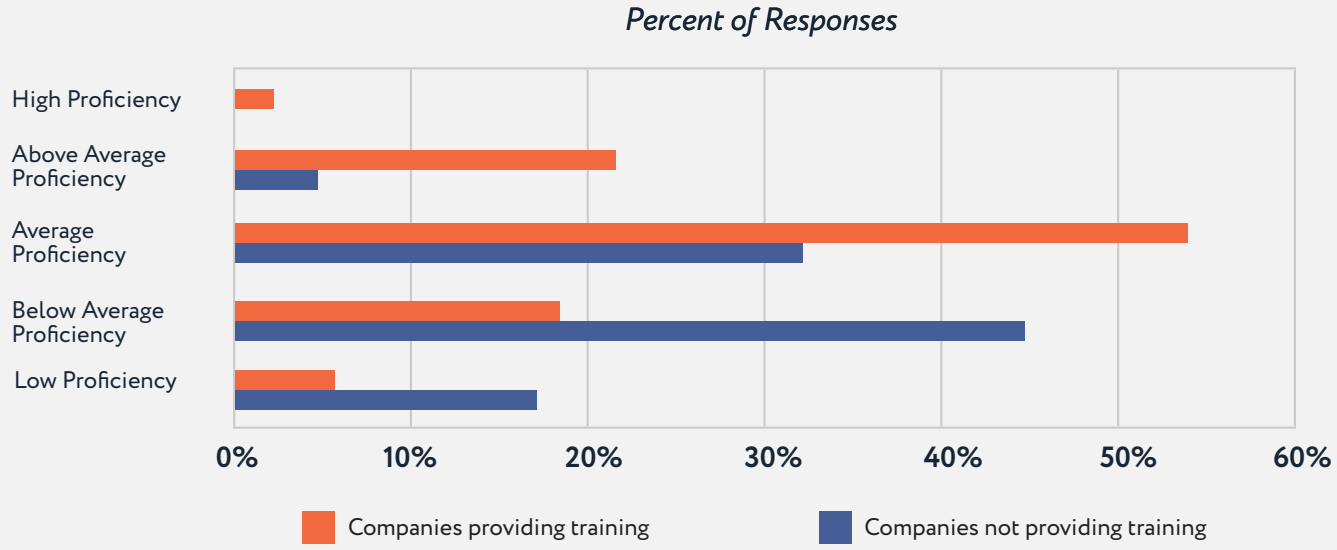
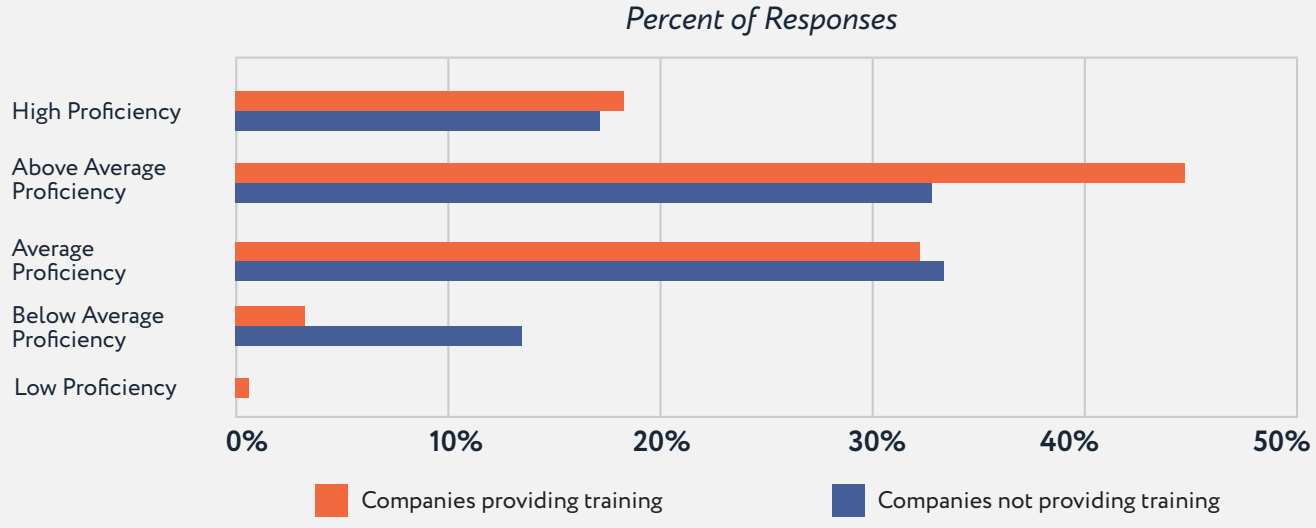


FIGURE 18

Technical Skills Proficiency Ratings for Journey-Level or Higher Craft Workers



For journey-level craft workers employed by companies that provide or do not provide training, the proficiency rating from the company survey is shown in Figure 18. The results indicate that journey-level craft workers employed by companies providing training are at an above-average proficiency level, while companies that do not train fall within the average proficiency level. These findings show that providing training for craft workers leads to better development of journey-level craft workers.

Additional data from NCCER's 2024 survey supports these trends regarding proficiency and productivity from training, especially regarding time to proficiency. When asked how much faster a formally trained craft worker reaches standard productivity compared to one trained only through on-the-job methods, over 80% of respondents reported that training inspired gains for craft worker proficiency ranging from 6 to 18 months. The most common estimate was a 6-month acceleration as shown in Figure 19. Additionally, over 30% of respondents indicated they saw an increase in speed to productivity of 24 months. This reduction in ramp-up time demonstrates a measurable, near-term benefit to structured training programs. These expectations are mirrored in ROI perceptions: over 60% of respondents expected to see a return on their craft training investment in 18 months or less, reinforcing the view that training offers a strong business case even in the medium term.

Figure 20 captures expectations from respondents to NCCER's 2024 survey regarding their expectations of a return from their investment on craft training initiatives. When asked when they expect to see a return from training, the majority of respondents, more than 60%, anticipated a return within 18 months or less. The most commonly selected timeframe was six months, followed by 12 and 24 months. Figures 19 and 20 together show that the industry sees training as effective and fast-acting. Training may accelerate worker readiness, and most organizations expect a return on that investment within 18 months or less.

Figure 19

Increased Speed to Productivity From Formal Training Compared to Only OJT

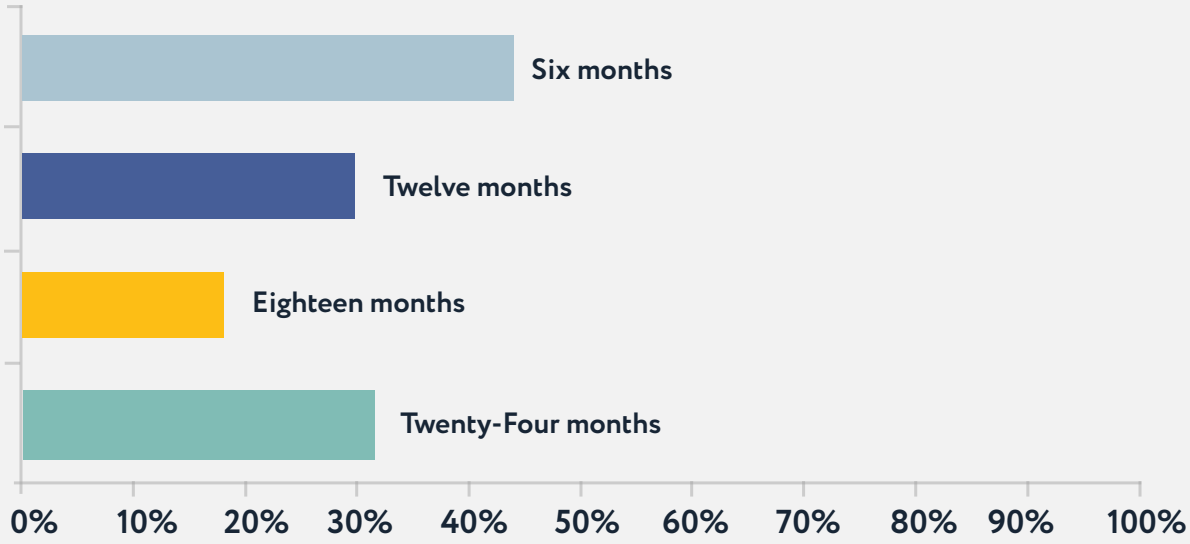
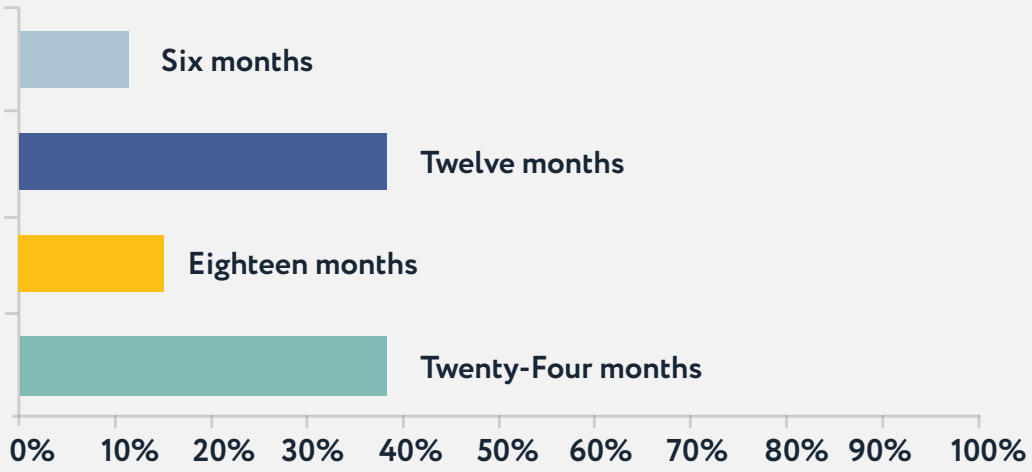


Figure 20

Over What Time Period Do You Expect to See a Return On Investment



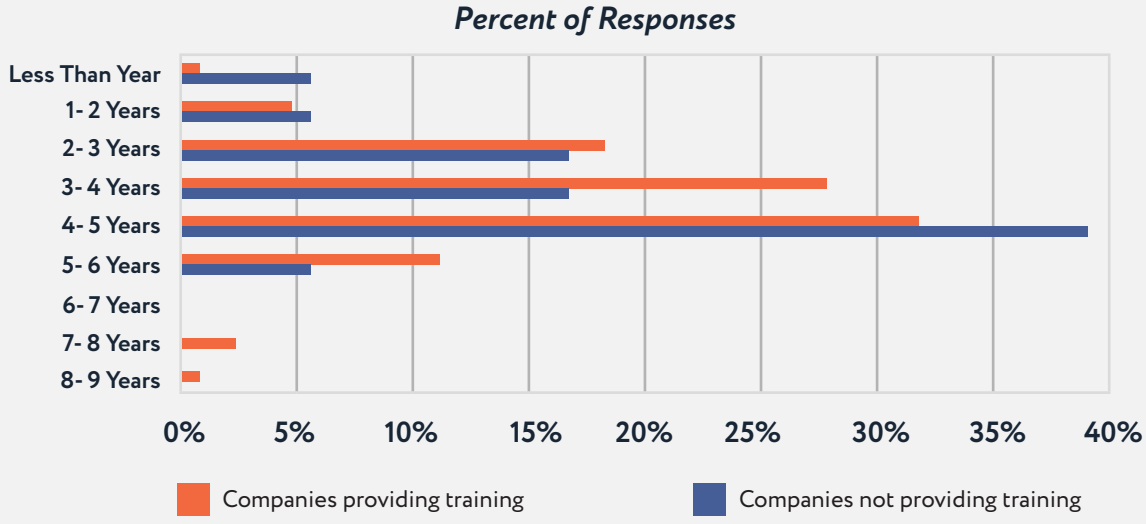
Perceived Technical Skills and Training

Comparing the technical skills of craft workers who work for companies that provide training and those that do not shows the importance of organizations funding training for craft workers. Figure 21 provides more evidence that trained craft workers reach journey-level skills sooner than craft workers who do not receive training from their employer.

New hires reach journey-level skills in three to five years for craft workers employed by companies that provide training, while those employed by companies not providing training reach journey-level skilling in around five years.

Figure 21

Time Required for New-to-Industry Craft Workers to Achieve Journey-Level Technical Skills

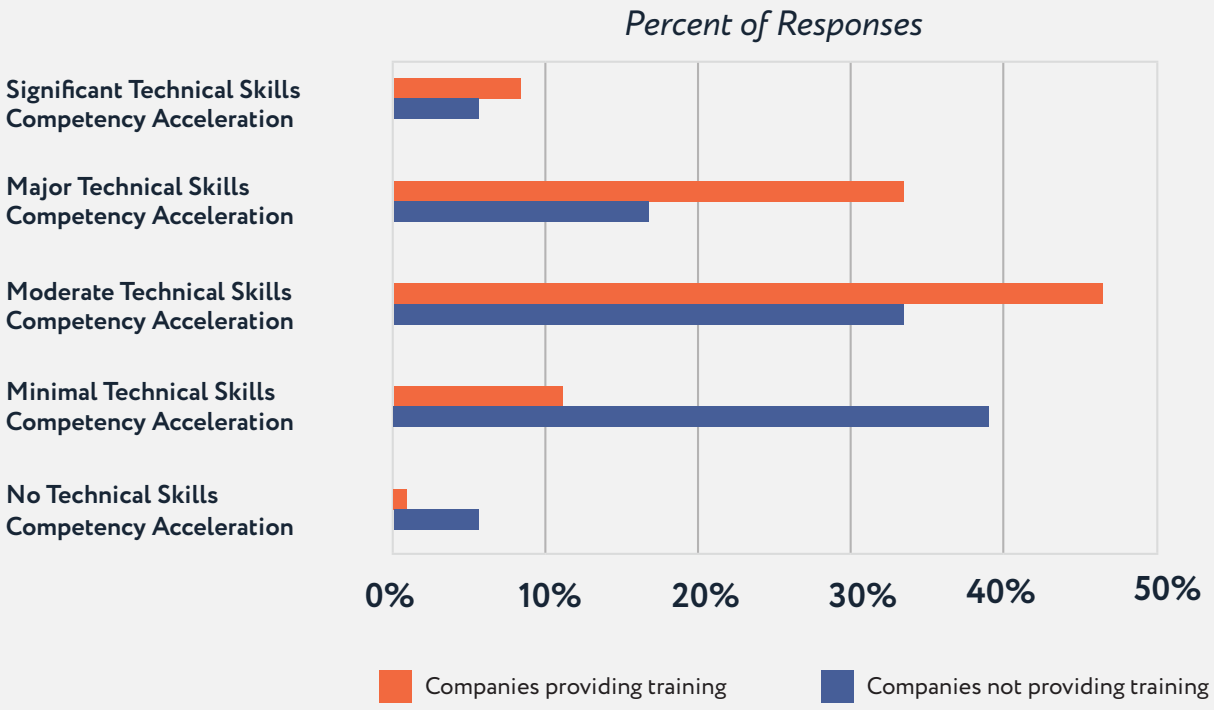


Technical Skills and Types of Training

This 2023 survey also collected data on the acceleration of gaining technical skills for a craft worker when using an industry-recognized/standard curriculum similar to the offerings provided by NCCER. Figure 22 illustrates that those companies using industry-recognized/standardized curricula to help train their craft workers show a moderate to major technical skills competency acceleration. Those companies that do not provide training show minimal technical skills competency training. The findings from Figure 21 and Figure 22 reveal that training can help accelerate a craft worker towards journey-level skills faster and earlier in their career than when craft workers are not regularly trained.

Figure 22

Formal Craft Worker Training Using Industry Recognized/Standardized Curriculum Provides



Performance Improvements and Training

Respondents were asked to provide information about observed performance improvements in this 2023 NCCER survey. Companies providing training were asked to rate potential performance improvements of craft workers after completing training. Companies not providing training were asked to rate the potential performance of craft workers after gaining field experience.

Figure 23

Observed Craft Worker Performance Improvements

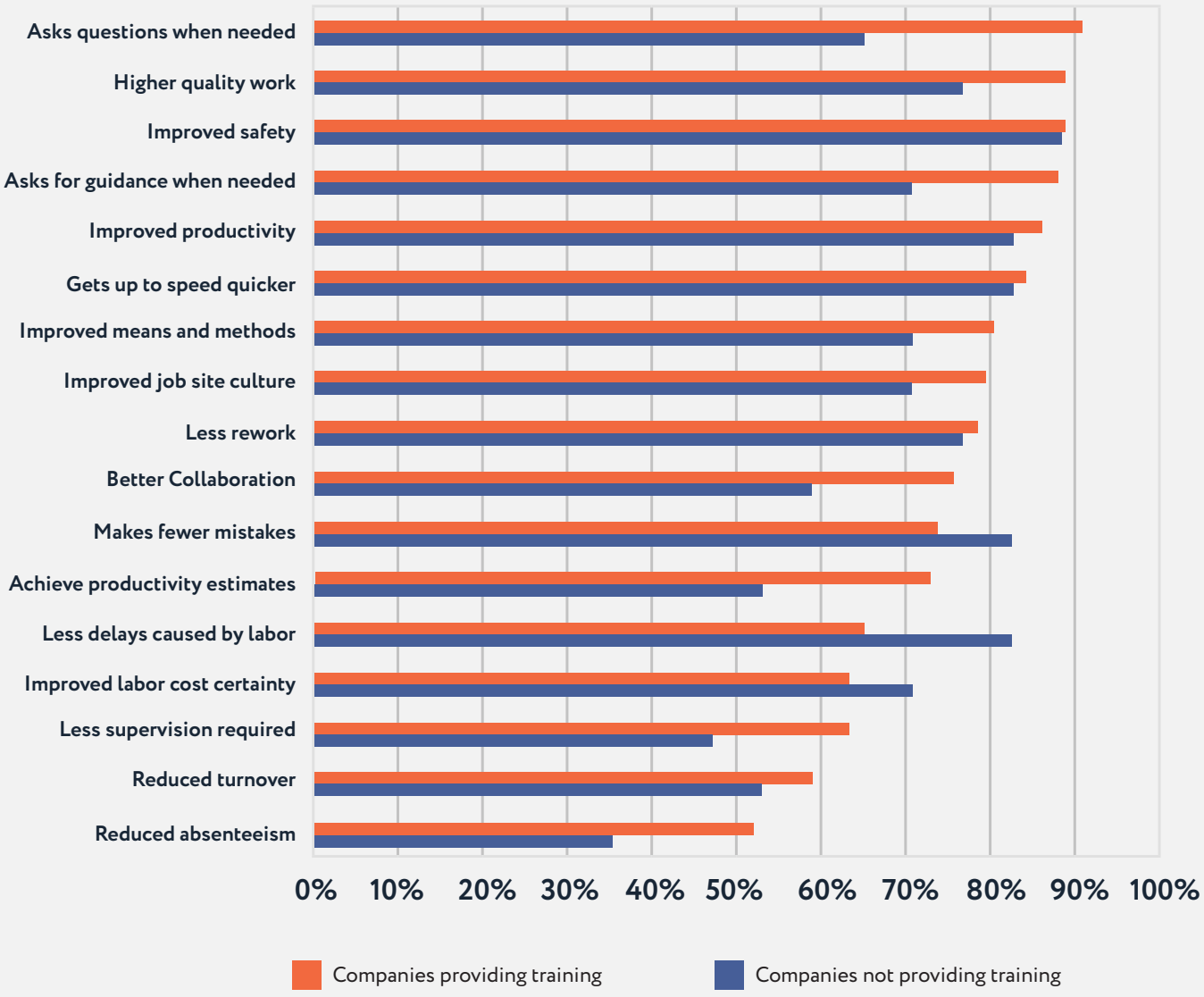


Figure 23 outlines the results for the various performance factors listed below. In most performance factors, the companies providing training agreed that they observed more performance improvements than those that did not. The major differences seen between the companies providing training and those not providing training are as follows:

1. *Employees Asks Questions when Needed*
   - Companies providing training – 90.6%
   - Companies not providing training – 64.7%

This disparity shows that trained craft workers are more likely to ask questions for clarification to verify that the work they are to perform is correct.

2. *Higher Quality Work*
   - Companies providing training – 88.7%,
   - Companies not providing training – 76.5%.

This finding reveals that companies providing training observe better quality work than those craft workers who work for companies that do not train.

3. *Employees Ask for Guidance when Needed*
   - Companies providing training – 87.8%
   - Companies not providing training – 70.1%

When craft workers are trained, they can ask questions and look for guidance to ensure they do their work correctly. Craft workers who work for companies that do not train are less likely to ask questions for guidance, which could lead to incorrect installations and rework.

4. *Better Collaboration*
   - Companies providing training – 75.5%
   - Companies not providing training – 58.9

Training helps craft workers to work together better on a project.

5. *Achieve Productivity Estimates*
   - Companies providing training – 72.6%
   - Companies not providing training – 52.9%

When craft workers are trained, they can understand their responsibilities better and carry out their work more efficiently, which helps projects attain their productivity goals.

6. *Less Supervision Required*
   - Companies providing training – 63.2%
   - Companies not providing training – 47.1%

Training craft workers helps impart the correct skills so they are less likely to make mistakes or need supervision to watch their work. This is helpful for projects that can then delegate supervision to other aspects of the project.

7. *Reduced Absenteeism*
   - Companies providing training – 51.88%
   - Companies not providing training – 35.3%

While the relationship between training and absenteeism is likely influenced by multiple factors, the data suggest that organizations that invest in structured training may be more likely to foster stronger employee engagement, clearer expectations, and a culture of accountability, all of which can contribute to more consistent attendance.

Performance Improvements

Participants, when asked about their current investment in formal technical skills craft training and to what extent they believe it impacted the following performance factors over the last five years, found that there were several areas where training investment showed positive results. This is shown in Figure 24. The majority of participants in this 2024 survey perceived formal craft training to significantly improved retention, productivity, recruitment, and safety.

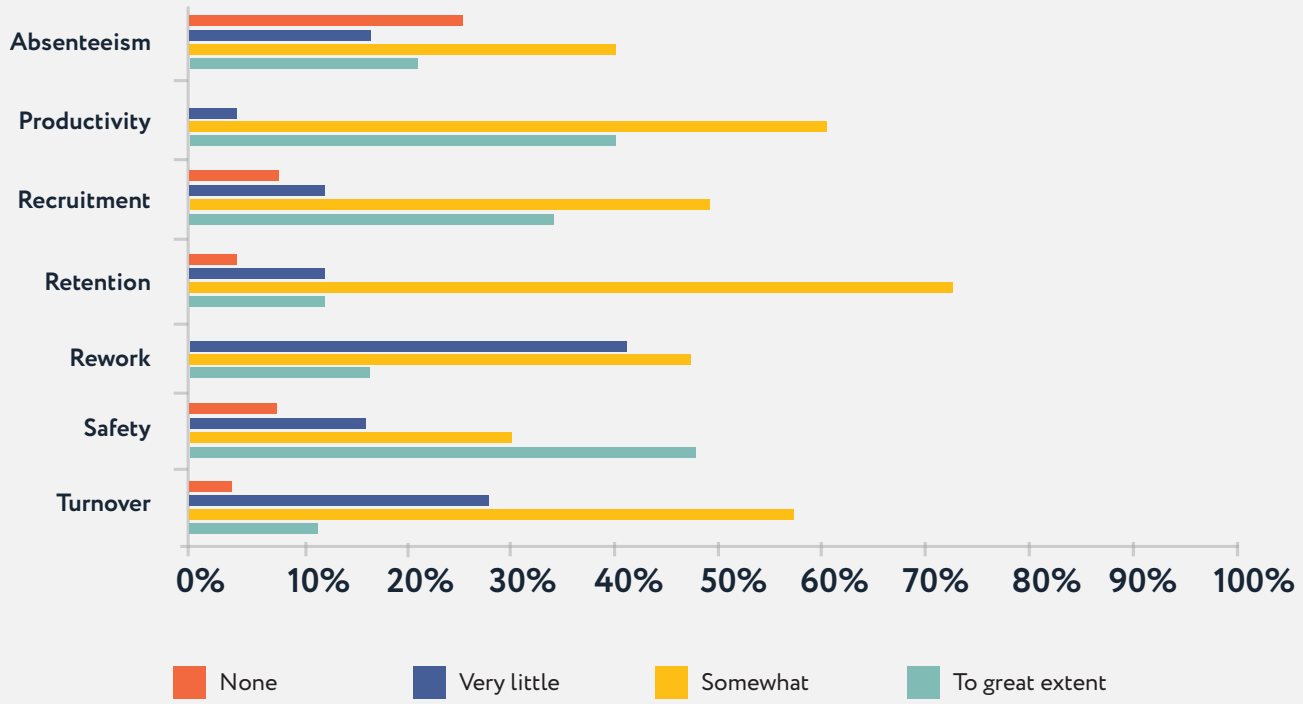
The strongest impact found via this 2024 survey was on retention, with a striking 84% of respondents seeing some positive impact on retention from training efforts. Productivity and recruitment were also seen as significantly affected, with 58% reporting that training had "somewhat" improved productivity and 38% reporting it had impacted it "to a great extent." When focusing on recruitment, 48% reported there was "somewhat" of an impact, and 32% said recruitment was affected "to a great extent."

Turnover showed a strong positive effect as well, with nearly 70% of respondents, 58% "somewhat," and 12% "to a great extent," reporting that training helped reduce turnover.

For safety, 46% believed training impacted it "to a great extent," while another 31% said "somewhat." This was one of the higher "great extent" ratings in the survey. Rework was perceived as moderately affected, with 44% selecting "somewhat," but 40% also selecting "very little," indicating more divided perceptions.

Figure 24

Observed Craft Workforce Performance Improvements



Recommendations For Industry

Based on the findings of this study, it is evident that improving the quality and accessibility of craft worker training has a measurable impact on individual performance and overall project outcomes. Construction industry stakeholders, including employers, trade associations, and workforce development organizations, should take a strategic and sustained approach to training if they want to mitigate the challenges of craft labor shortages, high turnover, and inconsistent job performance.

Expand Access to Structured Training for All Craft Workers

A number of craft workers within this study reported receiving training only on an "as-needed" basis, with some indicating they had received no formal training at all. While OJT remains a vital and continuous part of craft worker development, relying solely on informal, unstructured OJT can contribute to: (a) skill gaps, (b) increased rework, and (c) missed productivity targets.

Formal classroom training is essential not because it replaces OJT, but because it systematically fills the gaps, provides standardized instruction on critical skills, techniques, and safety practices that may not be fully addressed during daily work activities. To address this issue, industry organizations should work to expand access to structured technical skills training across all levels of experience and job roles.

Rather than reserving training opportunities only for high performers, companies should implement training strategies that ensure every worker has the opportunity to build skills and grow professionally. Formal programs that blend on-the-job training with structured instruction, guided mentorship, and hands-on learning should become the standard, not the exception.

Invest in Formal and Structured Craft Worker Training

- **Finding:** Craft workers and new hires reported receiving training only "as needed" or not at all; while OJT is a key component of learning, the lack of structured formal training leaves critical knowledge gaps.
- **Recommendation:** Establish structured training programs that complement daily OJT by providing formal instruction, hands-on practice, and standardized curricula such as those developed by NCCER.
- **Action:** Allocate resources to ensure new hires and early-career workers receive consistent, competency-based training that integrates both formal and informal learning from day one.

Provide Equal Access to Training for All Craft Workers

- **Finding:** High performers were often the only ones selected for training; others lacked access.
- **Recommendation:** Broaden access to training for all workers, not just top performers.
- **Action:** Develop inclusive training strategies and rotate training opportunities to include a wider range of employees.

Link Training to Promotions and Pay Progression

One of the most concerning findings in this study is the disconnect between training and career advancement, particularly for experienced craft workers. While newer workers often see training as a path to stability and growth, more seasoned workers indicated that training was not tied to promotions, salary increases, or expanded responsibilities.

To retain experienced talent and foster long-term workforce engagement, companies should ensure that training investments are directly tied to career advancement. Internal promotion pathways should be clearly outlined, and training milestones should be recognized with tangible benefits such as: (a) higher pay, (b) expanded job duties, or (c) movement into supervisory roles.

Link Training to Advancement and Pay

- **Finding:** Experienced workers reported that training did not lead to promotions or salary increases. According to the results, this led to dissatisfaction and higher turnover.
- **Recommendation:** Link training milestones to career progression, pay increases, and/or supervisory roles.
- **Action:** Create internal career pathways and prepare career progression plans for craft worker advancement with clearly defined training benchmarks and associated benefits.

Reduce the Financial Burden on Training

Even when training opportunities are available, a significant number of early-career craft workers in this study reported paying out of pocket for their own training. This financial burden can be a major deterrent to pursuing or continuing a career in construction, particularly for younger workers or those entering the industry from other sectors.

Employers and industry organizations should subsidize or co-fund training programs, especially for new hires. Training should be seen as an investment in workforce quality, not as an individual financial burden. Companies can also adopt tuition reimbursement policies or provide stipends for training-related costs, strengthening employee loyalty and reducing turnover among early-career craft workers.

Subsidize or Cover Training Costs

- **Finding:** A significant number of newer craft workers pay out of pocket for training, which may discourage retention.
- **Recommendation:** Sponsor training programs or implement shared-cost models with reimbursement options for employees.
- **Action:** Include training cost coverage or reimbursement policies in employee onboarding materials and benefits packages.

Adopt Industry-Recognized and Standardized Training Curricula

The results from both the craft worker and company surveys demonstrate that the use of standardized, industry-recognized curricula, such as those offered by NCCER, accelerates skill acquisition and leads to higher overall proficiency among craft workers. Organizations that used such curricula reported better outcomes in productivity, quality of work, and employee collaboration.

Standardized curricula not only provide consistent training across worksites but also ensure that craft workers are held to a uniform set of expectations and competencies. Industry leaders should adopt and promote the use of these types of curricula in their workforce development strategies, whether delivered in-house or through external partnerships.

Use Industry-Recognized/Standardized Curricula

- **Finding:** Companies using standardized curricula (e.g., NCCER) showed better performance metrics and faster progression to journey-level proficiency.
- **Recommendation:** Organizations should adopt or align with standardized industry training programs to improve training quality and accelerate competency development.
- **Action:** Partner with third-party providers or internal training departments to roll out NCCER or similar curricula.

Integrate Technology to Support Learning Access

As the industry continues to evolve, digital learning tools will play an increasingly important role in supplementing traditional training methods. Many craft workers already rely on smartphones and other mobile devices to access training content. However, a digital divide remains, especially among newer workers, who may not have the technology needed to complete online or blended training programs.

Employers and training providers should take steps to ensure access to training technology, whether by issuing mobile devices such as laptops or tablets, creating mobile-friendly training modules, or supporting learners with digital literacy tools.

Integrate Technology into Training Delivery

- **Finding:** Many craft workers use smartphones for training, but access to training tech is uneven.
- **Recommendation:** Develop mobile-accessible training modules and ensure all craft workers have the technology needed to participate.
- **Action:** Provide mobile devices, tablets, hotspots, or company logins for online learning and ensure tech support is available.

Reinforce Hands-On and Visual Learning Strategies

Hands-on learning and practical demonstrations were consistently rated as the most helpful training components by craft workers across all experience levels. In contrast, traditional tools such as textbooks and assessments were rated less helpful, particularly when disconnected from real-world applications.

Training programs should prioritize experiential learning through demonstrations, task simulations, hands-on applications, and structured mentoring. Where possible, training centers and job sites should integrate mock-ups, labs, and simulated environments that allow craft workers to practice technical tasks safely and with immediate feedback.

Expand Hands-On and Visual Learning Opportunities

- **Finding:** Hands-on applications and visual examples were rated as more helpful in this study particularly for least experienced learners; textbooks, online learning, and lectures less so.
- **Recommendation:** Prioritize practical, hands-on training supported by visual demonstrations and real-world scenarios, in both formal and informal training opportunities.
- **Action:** Incorporate simulation training or mock-ups where possible.

Use Training to Improve Retention and Reduce Turnover

The study clearly found that craft workers who receive meaningful training are more likely to stay with their employers long-term. Focus group participants emphasized that they would remain loyal to companies that invested in their development, even in cases where the pay was lower than that of a competitor. This underscores the role of training as a powerful retention tool.

To maximize this effect, companies should communicate training opportunities clearly, celebrate learning achievements, and create a culture that values continuous improvement. Retaining skilled workers not only reduces hiring costs but also contributes to safer, more productive worksites.

Use Training as a Retention Tool

- **Finding:** Craft workers are more likely to stay with companies that invest in their development.
- **Recommendation:** Promote training as of the company's retention strategy and communicate career growth opportunities clearly.
- **Action:** Develop transparent career pathways that outline the skills required at each level, the estimated time needed to advance, training options available, and associated wage increases where applicable. Leverage employee insights to identify how training influences retention, and align training with the factors that contribute most to long-term workforce stability.

Measure and Communicate the ROI of Training

While many companies reported performance improvements due to training, few have systems in place to consistently measure and communicate the ROI. This study has found that training contributes to gains in productivity, reductions in rework, improved collaboration, and decreased absenteeism. However, without intentional data collection and analysis, these benefits may go unnoticed or underappreciated.

Construction firms and trade associations should implement measurement tools to track training outcomes and inform future workforce planning. By quantifying the impact of training, companies can make stronger business cases for ongoing investment and continuous improvement.

Measure the ROI of Training Regularly

- **Finding:** Many companies do not track the impact of the training programs they provide based on productivity, rework reduction, and absenteeism. This allows training to be deprioritized as budgets, forecasting, and annual planning occur.
- **Recommendation:** Implement systems to measure ROI from training using performance data, including absenteeism, rework, safety incidents, and productivity.
- **Action:** Use tools and systems to track training ROI systematically

Conclusion

Construction craft professionals represent a vital part of the construction industry. Without a skilled craft workforce, projects risk cost overruns, delays, lower quality work, and less safe work practices. In addition, construction companies are struggling with attracting and retaining craft talent. By focusing on training and training quality, this study worked to determine the impact training has on projects and, ultimately, on construction companies as a whole.

Through this literature review, multiple surveys, and focus groups, we were able to find that high-quality craft training improves rework, productivity, and quality, along with having a positive impact on attracting and retaining talent.

Surprisingly, the survey and focus groups with craft workers revealed that most craft workers with zero to eight years of experience are only being trained as needed or are not receiving training. Furthermore, craft workers noted that OJT is the most common form of training provided to craft workers, and often they work on a trial-and-error basis. On a positive note, when training is provided, craft workers stated, and leaders saw, that work quality improves, and they work more safely. They also indicated that training increased the willingness for craft workers to remain with employers, especially those who invest in development and provide clear paths for advancement.

These surveys focused on the performance of craft workers employed by companies that provide training and those that do not provide training. The results found that companies providing training to their craft workers performed better in multiple areas compared to companies that did not. When craft workers are trained, labor productivity estimates are often achieved, and less rework is performed. Workers who are in the process of being trained as apprentices tend to achieve skill proficiency more quickly than workers who are not trained regularly. Also, journey-level craft workers achieve greater skill proficiency when employed by a company that trains them.

Overall, the study proves there is a lasting ROI that is apparent across multiple areas on projects and within companies. Taken together, the findings from this study make one point unmistakably clear: investing in robust craft-worker training is not a non-essential expense; instead, it is a strategic imperative that consistently returns value through safer jobsites, higher-quality work, and a more productive, loyal workforce.

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