Craft Training Issues in American Industrial and Commercial Construction

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Abstract: The construction industry relies on skilled craft workers supplied through various training programs. Based on a nationwide survey of industry experts regarding craft training programs, this paper examines the current state and effectiveness of construction craft training via 93 respondents from a wide range of U.S. industrial and commercial construction firms and associated craft training centers. The study's survey data allowed the writers to examine the major issues regarding craft training, such as the relative importance of basic core topics, training completion rates, the relation between trades' engagement and training, and the barriers of advancing craft training in construction. The paper also uses the experts' responses to estimate the benefits of craft training on productivity, turnover, absenteeism, safety, and rework. Various statistical methods are used to support the analysis. Problems are identified in craft training among the training programs examined and potential solutions for improving craft training effectiveness are suggested.

DOI: 10.1061/(ASCE)0733-9364(2008)134:10(795)

CE Database subject headings: Construction management; Labor; Personnel management; Training.

Current Workforce Situation and Craft Training in Construction

The construction industry is built on a foundation of skilled craft workers who are primarily supplied through various sources of craft training, including apprenticeships, firm-sponsored training, community colleges and vocational-technical schools, military training, and others. However, over the past three decades, the U.S. construction industry has experienced a growing shortage of skilled craft workers. In the early 1980s, The Business Round Table predicted that unless the training effort was improved, a shortage of skilled craft workers would occur, which would create problems for both open shop and union construction sectors by the late 1980s (BRT 1983). The prediction was confirmed in a 1996 study by The Business Round Table that found 60% of its surveyed members were experiencing a shortage of skilled craft workers. In addition, 75% of the respondents indicated the shortage had worsened in the 5 years prior to the study (BRT 1997). The shortage of craft workers unfortunately has become more severe in recent years. The Construction Users Round Table (CURT) conducted a survey in 2001, and among the survey respondents, 82% reported shortages on their projects, and 78% indicated that the shortage had worsened in the 3 years prior to the study (CURT 2001). In 2007, that number had risen to 86% (Sawyer and Rubin 2007). As a result of the shortage, significant spikes in craft wages have occurred in some U.S. geographic regions. In 2004, the average hourly wage for a pipe fitter in the Houston Ship Channel was about $18/h. In late 2007, it had risen to over $28/h. These data, both statistical and anecdotal, indicate that a significant shortage of skilled craft labor continues to exist in the United States and Canada.

Many factors are increasing the need for more craft training in construction. First, labor demand in the U.S. commercial–industrial construction market is rising and is expected to grow into the foreseeable future. The Construction Labor Research Council predicts that 185,000 new workers need to be attracted, trained, and retained each year up to 2016 in order for the industry to replace expected turnover and to sustain industry growth expectations (CLRC 2005). Similar research has estimated the rate to be closer to 200,000–250,000 new craft workers needed per year (CURT 2004). Second, the U.S. construction workforce is experiencing dramatic demographic changes. Recent research finds that the average age of a construction craft worker and the size of the Hispanic construction workforce are both significantly increasing (CLRC 2005). In 1985, the average age of the construction craft worker was 36.2 years, and 6% of the workforce was Hispanic (U.S. Bureau of Labor Statistics 1985). By 1995, the average age of a construction craft worker was 37.8 years, and 10.4% of the construction work force was Hispanic. In 2003, the national average age of construction workers rose to 38.7 years, and Hispanic workers accounted for 21% of the construction workforce (Srour et al. 2006). Although the increased percentage of Hispanic workers are filling a critical gap, unfortunately previous research indicates that Hispanic construction workers are less likely to participate in training than their Anglo counterparts. Hispanics also experience a disproportionate number of fatalities and injuries compared to their non-Hispanic counterparts (Richardson 2003). As the Hispanic population rapidly increases in construction, expanding and improving their training will be critical in order to improve their skills and decrease their injury rates. In

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Note. Discussion open until March 1, 2009. Separate discussions must be submitted for individual papers. The manuscript for this paper was submitted for review and possible publication on November 21, 2007; approved on March 3, 2008. This paper is part of the ***Journal of Construction Engineering and Management***, Vol. 134, No. 10, October 1, 2008. ©ASCE, ISSN 0733-9364/2008/10-795–803/$25.00.

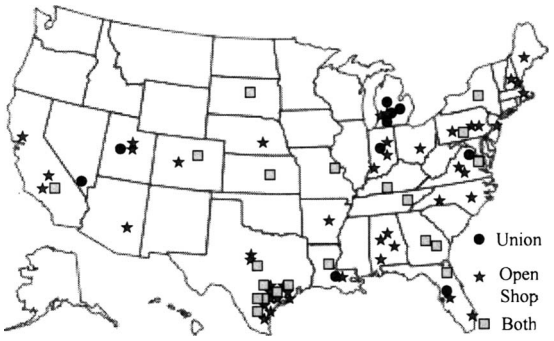

Fig. 1. Geographic distribution of the respondents

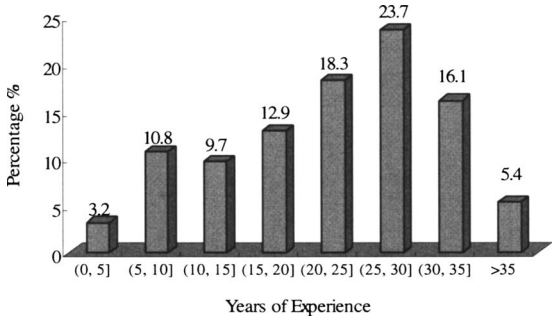

Fig. 3. Respondents' work experience in construction

addition, construction craft training can help relieve the aging problem by attracting younger craft workers into the industry (Liska and Weldzius 2000).

Considering the growing demand for craft workers in the face of increasing shortages of qualified workers, significant increases in craft training and resulting improvements in the availability of skilled craft workers are needed. Improving effectiveness of craft training would be valuable as well. In order to examine the current state of construction craft training, a study was conducted that involved a dozen site visits of training centers and that implemented a nationwide survey, including a significant sample of industrial and commercial construction firms and affiliated craft training centers in order to examine the effectiveness of these craft training efforts. Its results are reported here.

Survey and Data Collection

The purpose of the survey was to obtain information regarding major issues in construction craft training, including:

- Effectiveness of existing construction craft training programs;
- Relative importance of basic core training subjects;
- Percentages of training time devoted to formal classroom instruction and on-the-job training in different trades;
- Major barriers to advancing formal classroom training in construction; and
- Training completion rates in various trades and training programs.

The survey targeted training directors and construction managers in both the open shop and union construction sectors.

The survey was pilot-tested by 23 respondents before it was administered to a broad national population. Based on the feedback from the pilot survey, the researchers made major revisions to the survey's Likert scales in order to help facilitate subsequent quantitative analyses. The final survey was sent to 150 members of the Construction Industry Institute (CII) and to U.S. industrial and commercial contractors. From May through July 2006, 93 complete surveys were collected and then used in the study. A copy of the questionnaire and the detailed data analysis can be reviewed in the technical report published by CII (CII 2007a). Fig. 1 shows the geographic distribution of the survey respondents sorted by union status. Of all the respondents, 53.8% worked with firms that primarily employed an open shop workforce, 12.9% primarily employed a union workforce, and 33.3% of the organizations were engaged with both open shop and union workforces. The union percentage of the construction workforce as a whole in the United States is approximately 13.5% (Srour et al. 2006).

Respondent Identity

The largest segments of survey respondents were construction company site managers (28.1%), training directors (19.4%), and human resource managers (9.7%), as shown in Fig. 2.

The respondents averaged 23.4 years of experience in construction. Fig. 3 shows that 23.7% of respondents had between 25 and 30 years of experience in construction, and 3.3% of respondents had less than 5 years experience in construction.

Organization Identity

The survey respondents were employed by various types of organizations; 73.6% of the respondents worked for construction firms, 11.5% of the respondents worked for owners, and 16.1% of respondents identified themselves as working for other types of organizations, which included training organizations and maintenance service companies (Fig. 4).

The survey also collected information regarding the respondents' primary industry sectors of work. The data showed that 59.1% of the respondents' companies were in the heavy or light industry sector, and 40.9% of the companies were in the building

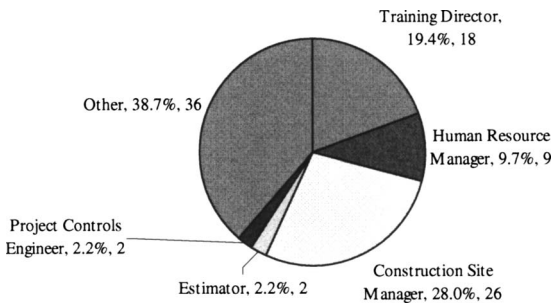

Fig. 2. Positions of the respondents

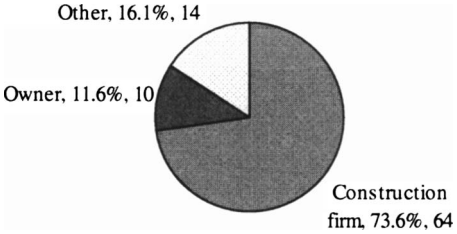

Fig. 4. Organization types of the respondents

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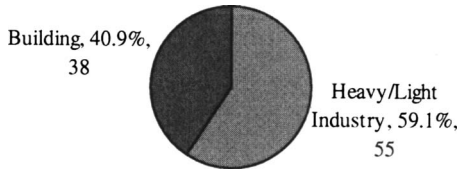

Fig. 5. Industry sectors represented by respondents

sector. The fact that many of the responding companies primarily work in the heavy/light industry sector is reflective of the CII membership (Fig. 5).

Current State of Craft Training

Formal Training and Informal Training

The writers examined the percentage of training time devoted to formal and informal craft training in construction. Formal training was defined as classroom training, as well as computer and internet facilitated and self-paced study, whereas informal training was defined as on-the-job training. Fig. 6 shows the percentage of the total training hours completed through formal and informal training by major construction trades, which included civil (civil site work), electrician, piping, other mechanical, and equipment operator and maintenance.

Among the surveyed companies, the writers found that the proportion of informal training was greater than formal classroom training among all major trades. Paired T tests were used to perform paired comparisons between the percentages of formal and informal training for any of two trades (Table 1). The study found that:

- Electricians had a significantly higher percentage of training time devoted to formal classroom training and a lower percentage of training time devoted to informal training than other trades; and
- Civil workers had a significantly higher percentage of training time spent in informal training and a lower percentage of time spent in formal classroom training than other trades.

The paired T test generated a hierarchy of the amount of formal training and informal training among the major construction trades. The trades having different letters have a statistically significant difference (level 0.05) between their percentages of formal training or informal training. For example, civil workers have a statistically significant different percentage of informal training than other trades, whereas there was no statistically significant difference among equipment operator/maintenance, piping, and other mechanical trades.

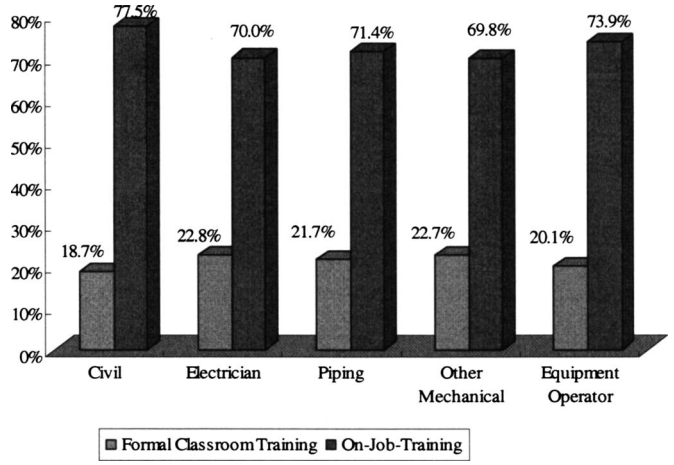

Fig. 6. Reported percentage of formal and on-the-job training by trades

To help validate the above-presented findings, data were examined from the Survey of Employer Provided Training (SEPT), which was conducted by the U.S. Bureau of Labor Statistics (1996). The SEPT survey involved approximately 1,000 private, nonagricultural business establishments and examined different aspects of training, including the type of training (formal or informal) provided to employees. The SEPT survey found that 76% of the training provided in the construction industry was informal, which mirrors the research survey results presented in Table 1. Only the retail sales industry reported a higher percentage of informal training in the SEPT survey.

It should be noted that on-the-job training is often equated with informal training because much of it is thought to be unplanned and unstructured. However, some on-the-job training is structured and organized around a learning plan with rotations through all aspects of the trade, close mentoring and coaching, with frequent feedback to the trainee. Although it would be beyond the scope of this study, a detailed study of the effectiveness of various forms of on-the-job training is warranted because it constitutes such a large portion of training time in construction.

Topics Taught in Craft Training

Most craft training programs cover core skills, such as basic math, introduction to blueprints, proper use of tools, safety, and communication skills. By interviewing craft training experts and investigating current training programs in both the union and open shop sectors, the writers identified eight core topics, which are usually covered in an introductory craft skills curriculum completed by all individuals during their first year of training,

Table 1. Hierarchy of Formal Classroom Training among Major Construction Trades

On-the-job training			Formal classroom training		
Trades	Percentage		Trades	Percentage	
Civil	75.5%	A	Electrician	22.1%	A
Equipment operator and maintenance	74.3%	B	Other mechaincal	21.7%	A
Piping	71.9%	B	Piping	21.0%	B
Other mechanical	70.4%	B	Equipment operator and maintenance	19.6%	B
Electrician	70.5%	C	Civil	18.7%	B

Note: The trades sharing the same letters indicate that their ratings of importance do not have a statistically significant difference at a level of 0.05.

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Table 2. Importance Rating Hierarchy of the Training Subjects

Training subjects	Rating	
Basic safety	4.93	A
Introduction to power tools	4.33	B
Construction math	4.20	B
Basic employability skills	4.18	B
Introduction to hand tools	4.15	B
Communication skills	4.04	C
Basic rigging	3.95	C
Introduction to blueprints	3.81	C

Note: The subjects sharing the same letters indicate that their ratings of importance do not have a statistically significant difference at a level of 0.05.

regardless of their trade. Next, the survey asked respondents to rank these eight core topics on a scale of 1 to 5, where 1 represents unimportant and 5 represents very important. Table 2 shows the average rating of training subjects sorted from high to low. The rating ranges from 3.83 to 4.94, which indicates that respondents believe that all eight currently taught core training topics are relatively important. However, there were differences in importance between training subjects. Basic safety training, with the highest average rating, was regarded as the most important subject. Introduction to blueprints, with the lowest average rating, was believed to be less important than other subjects.

Once again, the study performed a paired T test to identify whether the difference in average rating between any two subjects had statistical significance. The paired T test also generated a hierarchy of importance for core training subjects, which is shown in Table 2. The core-training subjects are listed in descending order according to their rank. The subjects sharing the same letters indicate that their ratings of importance do not have a statistically significant difference at a level of 0.05. For example, *basic safety* training is significantly more important than any other subject based on the survey respondents. The topics of *introduction to power tools, construction math, basic employability skills*, and *introduction to hand tools* were found to be the next set of topics of relative importance. Finally, *communication skills, basic rigging*, and *introduction to blueprints* were considered relatively less important compared to the other five topics.

Completion Rates of Craft Training

Based on experience of the survey respondents, the study estimated the percentage of workers in major construction trades who

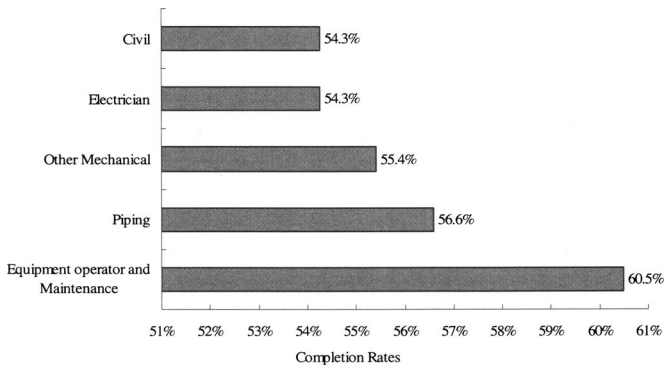

Fig. 7. Reported completion rates by trade

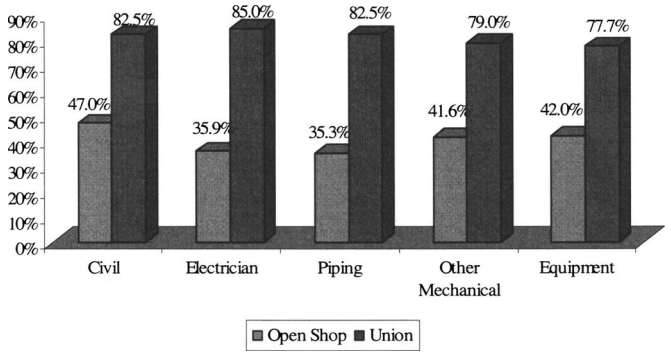

Fig. 8. Reported training completion rate by trade and union status

completed full craft qualification through either the completion of written and performance certification exams and/or an apprentice program after starting their training program. Fig. 7 shows that workers in equipment operator and maintenance training curriculums had the highest completion rate at 60.5%, and workers in civil and electrician training programs had the lowest completion rate of 54.3%. Overall, the training completion rate was 56.0%, which indicates that almost half of the workers did not complete their craft training program. Unfortunately, it is outside of this paper's scope to examine why many craft workers do not complete their craft training program; however, the study's estimated completion rates suggest that future research in this area is also warranted.

Next, the study compared the completion rates between union and open shop workers (Fig. 8).

For each trade, a t test was performed to compare the difference in reported training completion rates between union and open shop workers (Table 3). In civil, electrical, pipe, and other mechanical trades, survey respondents indicated that union workers had significantly higher completion rates than open shop workers. Other researchers (Bilginsoy 2003) have also reported significantly higher training completion rates in the union sector compared to the open shop sector.

Trade Engagement and Formal Training

The study also examined which trades tend to receive relatively more training. The survey asked each respondent to choose the trades that were parts of the business of his or her organization and the trades in which his or her organization provides formal classroom training. Based on the collected data, the researchers analyzed companies' rates of employing certain trades and at the same time providing formal training to them. Table 4 shows the trades for which the correlations between craft employment and formal training are statistically significant at the level of 0.01,

Table 3. Average Reported Training Completion Rates: By Union Status

Trade	Union (%)	Open shop (%)	Difference (%)	t value	Significance
Civil	82.5	47.0	35.5	2.25	0.03
Electrician	85.0	35.9	49.1	2.14	0.05
Pipe	82.5	35.3	47.2	3.16	0.01
Other mechanical	79.0	41.6	37.4	2.99	0.01
Equipment operator	77.7	42.0	35.7	1.62	0.13

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Table 4. Pearson Correlation between Trade Engagement and Training

Trades company engages and provides formal training	Pearson correlation coefficient	*P* value
Pipefitting	0.51	<0.01[a]
Electrical work	0.49	<0.01[a]
Boiler making	0.47	<0.01[a]
Millwright	0.46	<0.01[a]
Carpentry	0.39	<0.01[a]
Plumbing	0.34	<0.01[a]
Painting	0.33	<0.01[a]
Heavy equipment operation	0.33	<0.01[a]
Insulation	0.29	0.01
Structural steel and ironwork	0.27	0.01
Concrete work	0.27	0.01
Reinforcing steel work	0.25	0.02
Sheet metal	0.24	0.02
Construction craft laborer	0.23	0.03
Masonry	0.19	0.07

[a]Significant at level of 0.01.

which shows that if an organization employs these trades, there is also a significant probability that the surveyed organizations provide formal training in these trades.

Table 4 also shows the trades for which the correlations between craft employment and formal training were not significant. If an organization employs these trades, there is a significant probability that the surveyed organizations did not provide formal training to these trades.

The results of the correlation analysis confirmed an intuitive pattern. Those trades typically requiring significant technical skills, such as pipefitting and electrical work, had the highest significant correlations between employment by an organization and formal training by that organization. On the other hand, trades such as masonry and craft laborer, which require relatively less technical skills, typically did not have significant correlations between employment by an organization and formal training by that organization.

Table 5. Hierarchy of the Common Barriers of Craft Training

Common barriers for formal construction craft training	Average ratings	
Lack of new craft workers interested in formal training programs	3.37	A
Training schedule conflicts with work schedule	2.99	A
Training requires too much time to complete	2.88	B
Lack of financial resources	2.81	B
Lack of adequate instructors	2.71	B
Once trained, employees level our organization	2.69	B
Lack of support from job site supervisors	2.69	B
Inadequate completion rates of existing training programs	2.53	C
Language barriers	2.48	C
Training location is not accessible by our employees	2.42	C
Lack of adequate training facilities	2.41	C
Lack of adequate instructional material	2.31	D

Note: The barriers sharing the same letters indicate that their ratings of importance do not have a statistically significant difference at a level of 0.05.

Barriers to Construction Craft Training

The survey examined the barriers that companies and organizations experience in conducting a formal training program. Through consultation with craft training experts detailed elsewhere (CII 2007a), the researchers identified 12 common barriers which hinder formal training programs in construction. The respondents were asked to rate the barriers based on a 5-point scale, where 1 indicated that the barrier had no impact and 5 indicated that the barrier has a very severe impact. In Fig. 9, the barriers are listed in order from the greatest to least impact on a formal craft training program. "The lack of new craft workers interested in a training program" was chosen by survey respondents as the most serious barrier hindering the implementation of craft training in construction. It was followed by "Training schedule conflicts with work schedule" and "Training requires too much time to com-

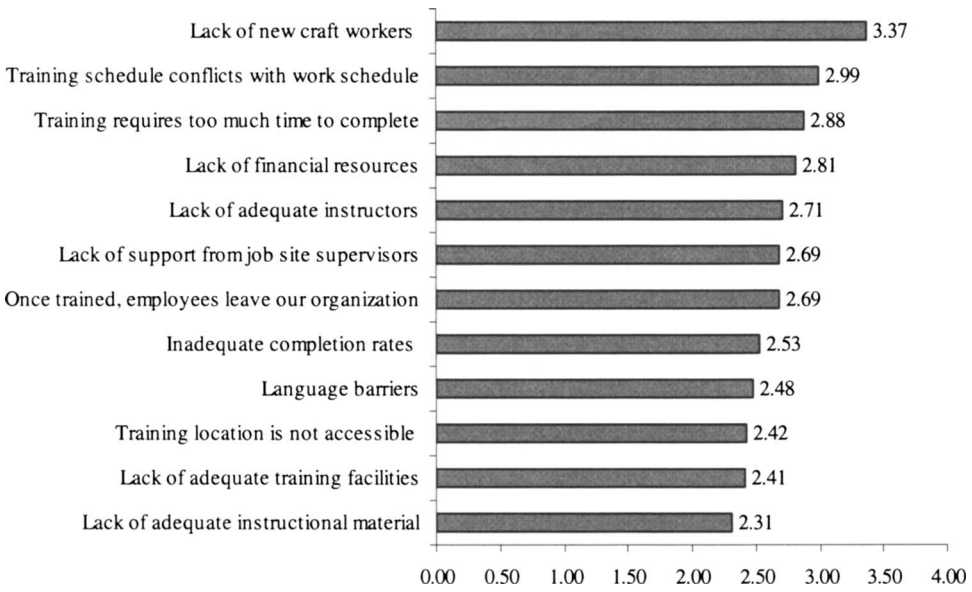

Fig. 9. Impact of common barriers to conducting formal craft training in construction

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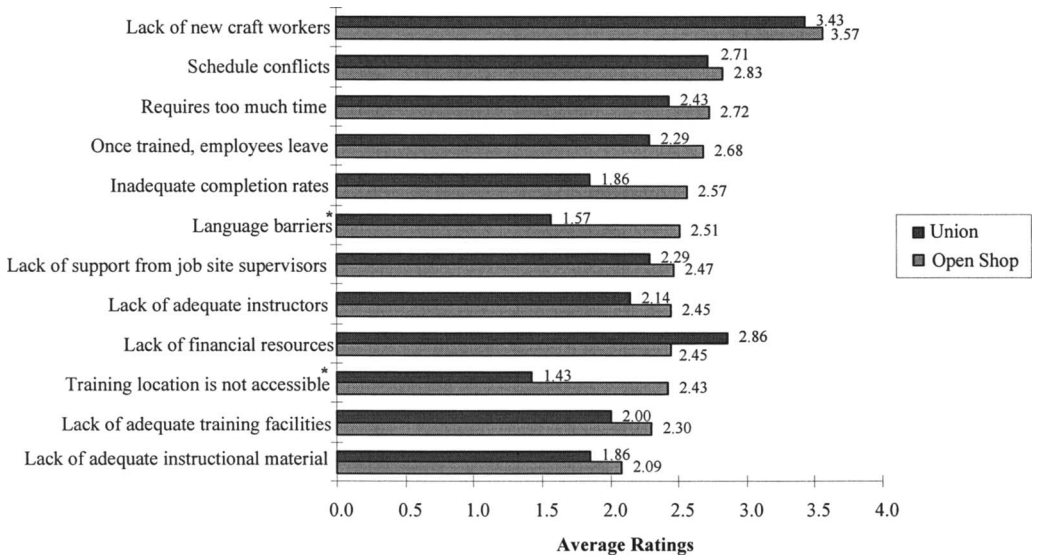


Fig. 10. Common training barriers (union versus open shop workforce)

plete." Among the 12 barriers, "Training location is not accessible," "Lack of adequate training facilities," and "Lack of adequate instructional material" were identified as the barriers having the least impact on advancing formal training in construction. Liska (1994) investigated the reasons that construction contractors did not train their employees. In order of decreasing significance, the barriers were: lack of money, lack of time, lack of knowledge, high employee turnover, workforce too small, past efforts not effective, hiring only trained workers, and lack of employee interest. In comparison to Liska's results (1994), it is now evident that the shortage of craft workers worsened and is now considered the most severe barrier to craft training efforts based on the survey respondents.

The study used a paired T test to identify whether the difference in average rating between any two barriers was statistically significant. In Table 5, the barriers sharing the same letter mean that their ratings of importance did not have a statistically significant difference at a level of 0.05. For example, the lack of new craft workers interested in a formal training program has the same impact as conflicts between training schedule and work schedule at a level of 0.05, but these three barriers did have significantly more impact than any other barriers.

Next, the study compared the impact of training barriers between organizations engaged with an open shop versus a union workforce. Once again, the greatest single barrier for both groups, was a "lack of new craft workers." Fig. 10 shows that the organizations engaged with an open shop workforce indicated that the barriers had higher average impact ratings than those using a union workforce, except for "lack of financial resources."

However, a one-way ANOVA was performed to examine whether the differences between union and open shop were statistically significant. Only two barriers were found to be statistically more significant in the open shop than in the union sector: "Training location is not accessible" and "Language barriers." Although the analysis does indicate that differences existed among the survey respondents who worked with union and open

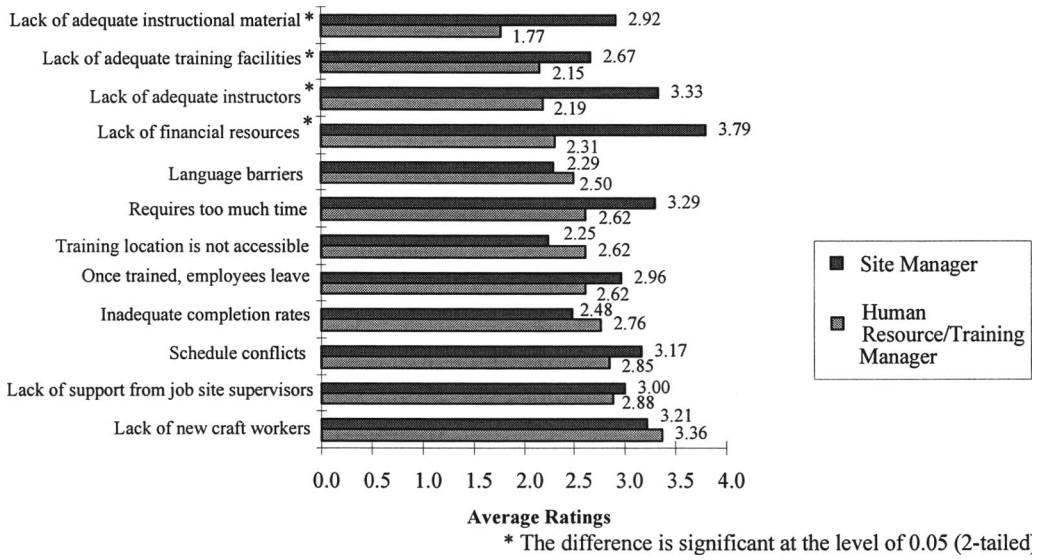


Fig. 11. Common training barriers (site manager versus human resource manager)

Table 6. Summary of Expected Training Benefits Estimated via Craft Training Survey

	Capital project			Maintenance project		
		95% confidence interval			95% confidence interval	
Benefits	Average (%)	Lower bound (%)	Upper bound (%)	Average (%)	Lower bound (%)	Upper bound (%)
Improved productivity	10.6	6.8	14.4	9.9	7.7	12.1
Reduced turnover	13.9	10.3	17.5	13.7	8.0	19.3
Reduced absenteeism	14.5	10.0	19.1	14.6	8.3	21.0
Reduced injuries	25.5	18.1	33.0	27.5	17.8	37.2
Reduced rework	23.2	17.2	29.1	26.5	17.9	35.1

shop workers, in general the barriers were quite similar between the two groups.

Next, the study compared the ratings of training barriers by survey respondents employed as construction site managers with the responses of human resource/training managers (Fig. 11). Generally, site managers believed that the barriers had a more severe impact than human resource/training managers. Site managers indicated that the greatest impact on training came from "lack of financial resources," followed by a "lack of adequate instructors," and "too much time required for training." Once again, a one-way ANOVA was performed to examine whether the differences were statistically significant, and as shown in Fig. 11, these differences were statistically significant above the 0.05 level.

Responses of human resource/training managers contrasted with those of site managers. Human resource/training managers believed that the greatest impact on training came from "lack of new craft workers interested in training," followed by "lack of support from supervisors," "conflicts between training schedules and work schedules," and "inadequate completion rates for existing training programs." However, the ANOVA indicated that these differences were not statistically significant above the 0.05 level.

Craft Training Benefits

After identifying the current characteristics of craft training, the study examined the effectiveness of craft training efforts based on the perceptions of the survey respondents. Not knowing the effectiveness of craft training efforts impedes the development and implementation of craft training programs throughout the U.S. construction industry. Previous research found that in contrast to other industries, little research has been devoted to evaluating the returns to training in construction (Glover et al. 1999). In this study, the survey found that only 13.2% of respondents indicated that they measured the costs and benefits of their craft training efforts. The two most frequent reasons given for not measuring the costs and benefits were that respondents did not know what should be measured to determine the returns on training and that many considered training to be essential regardless of any measured return.

The respondents were asked to estimate the effectiveness of craft training on construction performance based on their experience with construction craft training efforts, assuming that they invested 1% of a project's total budget for labor cost into training. The average for U.S. corporations in general is about 1.25% (Economist 2006). The respondents provided their expectations regarding the impact of craft training on productivity, turnover, absenteeism, injuries, and rework under two types of scenarios:

- On a typical 24-month capital project; and
- On a typical ongoing maintenance/small capital contract.

They were also asked over what time period the benefits were expected to develop. This information was used for a return of investment (ROI) in training analysis presented elsewhere (CII 2007b). Respondents indicated that training improves productivity and decreases turnover, absenteeism, injuries, and rework. Table 6 shows the average improvement rate with 95% confidence intervals. The study compared the differences under the two scenarios of craft training being implemented on either a typical 24-month capital project or an ongoing maintenance/small capital project by paired T tests, revealing no statistically significant difference between type of project.

Considering that human resource managers may have more at stake in the perceived performance of craft training programs than construction site managers, the study compared the difference between these groups. The results are shown in Table 7, and although there are observed differences there was little statistical significance for the differences between the human resource managers and site managers regarding their evaluations of craft training benefits.

The study also compared the difference between respondents associated with union and open shop organizations regarding the

Table 7. Craft Training Benefits Estimates (Human Resource Manager versus Site Manager)

Benefits	Human resource manager (%)	Site manager (%)	Difference (%)	*t* value	*P* value
Improved productivity	16.2	8.7	7.6	1.144	0.190
Reduced turnover	16.1	10.3	5.8	1.281	0.210
Reduced absenteeism	12.5	14.0	−1.5	−0.305	0.762
Reduced injuries	31.2	26.5	4.7	0.443	0.661
Reduced rework	21.6	25.6	−4.0	−0.495	0.624

Table 8. Craft Training Benefits Estimates by Union versus Open Shop Employers

Benefits	Open shop (%)	Union (%)	Difference (%)	*t* value	*P* value
Improved productivity	13.3	8.7	4.6	0.593	0.558
Reduced turnover	16.0	11.0	5.0	0.860	0.396
Reduced absenteeism	14.4	12.5	1.9	0.246	0.807
Reduced injuries	23.9	33.7	−9.8	−0.569	0.591
Reduced rework	21.4	27.5	−6.1	−0.461	0.662

Table 9. Turnover and Absenteeism for Workers at Company A: By Training Status

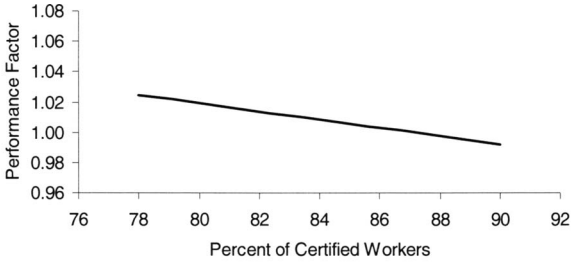
Turnover/ absenteeism rates	Workers with no training (%)	Worker receiving training (%)	Difference (%)	Z value
Voluntary turnover rate	6.5	0.6	5.9	19.12[a]
Absenteeism rate	7.3	2.5	4.8	9.73[a]

[a]Significant at the level of 0.05.

craft training benefits. The results are shown in Table 8. Again, although there are observed differences there was little statistical significance for the differences between the union and open shop respondents regarding their evaluations of craft training benefits. Based on the culmination of the above presented ANOVA analyses, there is a collective belief among the study's research population that craft training does result in significant project benefits.

To validate the survey findings regarding the expected benefits of craft training, the writers examined actual training data from two construction firms, which are referred to as Company A and Company B to protect the confidential nature of their data. Both companies are engaged in heavy industrial construction work throughout North America. Company A monitored the absenteeism and turnover rates on four projects over a 15-month period among three groups of craft workers: (1) individuals who had completed their respective training program and obtained certification; (2) individuals engaged in training but who had not yet achieved certification; and (3) individuals who had not engaged in craft training. For the analysis, those who had completed training (Group 1) or who were in training (Group 2) were consolidated. Based on Company A's data, the study found that craft training had a rather immediate impact on both craft turnover and absenteeism (Table 9).

Company B was engaged in a construction maintenance project in which the owner actively promoted skill certification of all craft workers employed on the project. The owner required craft workers to obtain both written and performance certification within their respective trade. Over a 12-month period on one construction maintenance project, Company B measured the percentage of its craft workers that had obtained their certification and the corresponding productivity performance factor on the project. In this case, the productivity performance factor was defined as the expected productivity divided by the actual productivity; thus, a productivity performance factor of less than one indicates better than expected productivity performance. Although the case study involved a limited sample size, a statistically significant relationship was found, as shown in Fig. 12 and Table 9, indicating that as the percentage of certified craft workers increased, the project's productivity improved (i.e., performance factor decreased).



Independent Variable		Model Summary		
Constant	Percentage of Certified Plus Workers	F	R^2	Adj. R^2
1.2366 (13.703*)	-0.0027 (-2.545*)	6.478*	0.391	0.332

Note: Dependent Variable is productivity performance factor and a declining performance factors indicates an improvement in productivity; t-values shown in parenthesis; * Significant at the level of 0.05

Fig. 12. Relation between percent of certified plus workers and project performance factor

The results of the case studies indicate that craft training is associated with improved productivity and reduced turnover and absenteeism, which echoes and corroborates the craft training survey findings.

Conclusion

Based on the study's industry survey data and company case studies, and as corroborated by governmental data sources, the researchers found that the majority of construction craft training is informal training, which varies from 70.5% of total training hours for electrical workers to 77.5% for civil workers. On-the-job training is not necessarily a bad form of training. Indeed it is widely viewed as a critically important component of successful construction craft training. However, on-the-job training may be most effective if accompanied by a learning plan, close on-site mentoring and coaching of the trainee, frequent feedback about performance, and deliberate rotation of the trainee among different aspects of the trade (CII 2007b). Regardless, informal training cannot replace formal training, which teaches workers crucial skills in basic safety, construction math, blueprint reading, and the use of tools, along with advanced trade-specific topics. According to the survey results, basic safety is considered the most important subject in the basic-core curriculum of a formal craft training program, followed by introduction to power tools, construction math, basic employability skills, and introduction to hand tools.

The construction industry is facing a serious problem with completion rates in formal training programs, especially in the open shop sector. The survey respondents indicated that training completion rates for the open shop organizations averaged only 40.3%. For the union sector, the reported training completion rate was 81.3%.

The study also identified factors hindering the implementation of formal training in construction. Although conflicts with construction schedules, too much time required for training, and a lack of financial resources were identified by the survey as significant barriers to craft training, the lack of new workers interested in entering the formal craft training program was the most severe barrier in both the union and open shop sectors, from the perspective of the employers.

The study found that most of the surveyed companies did not measure craft training benefits. Yet the respondents anticipated significant benefits of craft training in reductions of absenteeism, turnover, rework and injuries, as well as improved productivity. The study estimated the expected benefits in these areas based on the survey results. It was found that the differences in the perceived benefits among site managers and human resource managers and among those involved with union versus open shop workforces though observable had little statistical significance. The results show that both construction site managers and human resource directors believe that benefits of craft training exist, regardless of whether training is implemented in the open shop or union sector. Another related study based partially on these results

indicated that the benefits can significantly outweigh the costs (CII 2007a).

The writers believe that the relevance of these findings is significant to industry. Throughout much of the construction industry, especially in the open shop sector, craft training is considered an elective option for a contractor to pursue. Unfortunately on many competitively bid projects, the costs of craft training is viewed more as a risk in potentially losing a bid to another competitor who does not make a similar investment. However, these results show that industry experts expect a relatively modest investment in craft training, compared to the U.S. general industry's average investment in training, will produce significant gains in productivity, safety, rework, absenteeism, and turnover. Although these improvements could significantly impact a project's bottom line, the more important ramifications of increased craft training is to improve the sustainability of the construction industry by improving the availability of a skilled workforce.

Acknowledgments

The writers thank the Construction Industry Institute, the National Center for Construction Education and Research, and the Construction Users Roundtable for funding this research, along with the numerous affiliated companies and individuals who participated in the research.

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