



**MULTISKILLING LABOR STRATEGIES IN CONSTRUCTION:
EXPERIENCES WITH MULTISKILLING
LABOR STRATEGIES IN THE CONSTRUCTION INDUSTRY**

by

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**A Report to
The Construction Industry Institute
The University of Texas at Austin**

**Under the Guidance of the
Multiskilling Research Team**

**from
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Executive Summary

Labor productivity, craft training, and the declining number of trade entrants into construction present critical challenges for our industry today. More flexible labor strategies may meet these challenges by improving project performance and better utilizing the current pool of skilled workers. One potential solution, already being used by some companies, may be multiskilling.

Multiskilling is a labor utilization strategy where workers possess a range of skills appropriate for more than one work process and are used flexibly on a project or within an organization¹. This study explored the application of multiskilled labor utilization strategies in construction and estimates the project impact of their use.

Research efforts focused on: (1) determining the extent of multiskilling use in the construction industry, (2) identifying opportunities for the use of multiskilling, (3) developing an economic equation to model the cost benefits of multiskilling, (4) assessing the effect of multiskilling on worker and project, and (5) assessing barriers to the use of multiskilling. The scope of the study included a detailed project level analysis of a hypothetical, domestic, grass-roots, open shop, direct hire, industrial construction project. It also included analysis of existing multiskilling applications in construction via surveys and other techniques. The study used traditionally accepted trade delineations to form the “multiskills” used in the analysis. Also, productivity data/analysis techniques including (1) cost projections based on crew productivity and average worker-hour costs, and (2) scheduling tools which allow resource allocation and overhead costs analysis, were used to estimate the project impact.

¹ A more complete definition of multiskilling is that it is a labor utilization strategy where workers possess a range of skills appropriate for more than one work process and are used flexibly on a project or within an organization. It is a managerial strategy based on developing competency within the workforce and the full utilization of these capabilities. Workers can be assigned to construction tasks based on their ability to perform the needed skill/task unrestricted by traditional job descriptions or work boundaries.

A multiskilled construction trade worker is an individual who possesses or acquires a range of skills and knowledge and applies them to work tasks that may fall outside the traditional boundaries of his or her original trade. In a construction context, this does not necessarily mean that a worker obtains or possesses mastery level skills in multiple trade areas. However, based on the flexible application of skills the worker already possesses or is willing to acquire, the worker can be an effective and productive contributor to the work output of several traditional trade disciplines.

Benefits of multiskilled labor utilization were observed with regard to total project labor cost, employment opportunities for construction workers, and other industry labor issues. These benefits included conservative estimates of 5% or more total labor cost savings, a potential 35% reduction in required project workforce, a potential 47% increase in average employment duration, and an increase in wage/annual earning potential for multiskilled construction workers. Productivity improvements were reported by over 75% of those surveyed in the study.

The most successful multiskilling strategy assessed in this analysis was one that identified four multiskilled crafts' groupings. The four multiskilled crafts included civil, electrical, mechanical and a general support craft that included all craft helpers. This strategy may also offer additional benefits with respect to multiskilling implementation, craft recruiting and retention, and craft training. The data were supported by results of the practice surveys of existing construction multiskilling applications conducted as part of this research. The distribution of projects included in the current multiskilling practice surveys indicates that multiskilling is a viable labor strategy in both union and non-union environments.

A review of managerial and economic multiskilling results from manufacturing applications also indicated that multiskilling strategies provide increased opportunities for the development of process innovations and technology implementation. It is believed that multiskilling strategies may provide a breakthrough in construction labor utilization that leads to many other industry advancements.

Impediments to effective multiskilling are both fundamental and practical. Fundamental impediments are more difficult to overcome and include limits on human skill retention and the complexity of maintaining a multiskilled work force from management and human capital investment perspectives. Practical impediments include owner bid requirements, project management infrastructure, resistance to change, and licensing requirements among others. Nevertheless, multiskilling is already being used by some major industry participants as a strategic business advantage. It remains for further research to determine where

the best opportunities for multiskilling exist, how to identify them, and how to implement multiskilling most effectively.

Abstract

The construction industry is currently suffering from problems associated with labor shortages, rising project costs, and declining productivity levels. Multiskilling, a flexible labor strategy, perhaps holds the solution to many of these current problems. Multiskilling is a labor utilization strategy where workers possess a range of skills appropriate for more than one work process and are used flexibly on a project or within an organization. Training in additional crafts prepares workers to perform a variety of tasks in a safe, proficient, and productive manner. This volume presents the findings from research conducted with project participants on construction sites currently utilizing a multiskilled labor strategy. A literature search was also utilized to identify current published experiences with multiskilling. Projects surveyed included both capital and maintenance projects and union and non-union work forces. The benefits, impediments, and limitations to the implementation and sustainment of a multiskilling program are presented. Specific attention is paid to the benefits that multiskilling can potentially offer the construction worker, project, and industry. Impediments and limitations that must be considered during the implementation phase of a multiskilled system are also discussed. The volume concludes with a mini project level analysis of performance data from an implementation process at Sterling Chemical Company.

1. Introduction

1.1 Introductory Statement

The traditional construction process is a very labor intensive process where it is not uncommon for labor costs to account for 30%-50% of the total project costs (Adrian 1987). Historically, the construction industry has utilized traditional trade delineations to complete work tasks on projects. As early as the 1980's, research suggested that the division of labor into separate trades with little or no overlap was leading to increased cost, little or no worker flexibility, and labor misallocation (Bourdon and Levitt 1980). Research has also indicated that there has been a decline in the productivity of the construction workforce in the last 20 years (Halverson 1995). Declining productivity levels have been linked to the increased complexity of designs, more stringent and restrictive governmental regulations, site congestion, scheduling problems, and the inefficient organization of the construction process (Sebastian and Borcharding 1979; Halligan, Demsetz, Brown, and Pace 1994). It is also possible that the shortage of skilled trade workers has also contributed to the declining productivity levels. The decline in productivity has exacerbated problems for contractors as they seek to cut costs in order to compete for jobs in a highly competitive job market.

One potential solution for many of the problems surrounding the traditional construction labor strategy is multiskilling. Multiskilling is a progressive labor allocation strategy that utilizes trade workers in flexible roles to match the normal work process. Traditional rigid trade lines are eliminated, and the worker is allowed and expected to work in multiple trades as long as he or she is proficient and safe at the task being performed. Each tradesperson is trained skills in one or more trades. Training in multiple trades better equips the worker to perform duties that are associated with a complete unit or system of work, thereby reducing or eliminating many of the inefficiencies that lead to decreased productivity and which are detrimental to the attitude of the construction worker (Burleson 1997; Williamson 1992; Williamson 1994).

1.2 Objectives

The efforts undertaken for this volume were part of a larger research project performed by The Construction Industry Institute Research Team 137 (RT 137). RT 137 had two primary objectives:

1. Investigate the extent to which multiskilling is being used in the construction industry,
2. Investigate the applicability of multiskilling strategies in the construction arena.

Research performed and included as part of volume I correspond to the first objective of RT 137. As a further refinement of objective (1) above, the research effort centered on investigating the benefits, impediments and limitations that are associated with multiskilling. Each of these areas were investigated relative to both the construction project and the construction worker.

1.3 Scope

The scope of this phase of the research was relatively narrow. The study utilized industry contacts provided by RT 137 as sources of information. The majority of the information included herein was acquired from CII member companies and from literature searches. No extensive effort was made to identify and contact a large number of companies to investigate their experiences with multiskilling.

1.4 Brief Methodology

Three main avenues were used during the course of the research effort. First, a literature search was completed to gather documented examples and experiences of companies with multiskilling. No effort was made to restrict this search to construction related articles as it was hypothesized that much of the information regarding multiskilling would be available in other industry sectors. Articles relating

to multiskilling, human resources management, and construction labor management were examined. Second, a series of interviews and surveys were conducted with project managers, industry representatives, and other project personnel who had experience with multiskilling. These interviews and surveys were conducted via phone and facsimile using both predetermined questions and follow-up questions. Third, a report supplied by an RT 137 member from a construction site that included data from before and after the implementation of multiskilling was used to partially substantiate the beneficial aspects of multiskilling.

1.5 Report Structure

The structure of this volume of the report follows a traditional format. Chapter 2 supplies background information related to multiskilling and also is a brief discussion of information available in published literature. Chapter 2 also includes a brief discussion of volumes II and III that were completed as part of RT 137's work. Chapter 3 is a more in-depth discussion of the research methodology used as part of the research effort. Chapters 4 through 8 present the research results. Chapter 9 presents conclusions and recommendations drawn from the research. The research results are presented in the following order:

- Chapter 4 examines the benefits that projects have experienced in switching to a multiskilling strategy, and other benefits that can be expected from the use of multiskilling.
- Chapter 5 presents the benefits that workers can expect from multiskilling.
- Chapter 6 discusses potential impediments to the implementation and sustainment of a multiskilling program.
- Chapter 7 focuses on current issues in the construction industry that limit the use of multiskilling programs.
- Chapter 8 presents a case study on the multiskilling implementation process at Sterling Chemical Company's Texas City site.

Although the research results are divided into several chapters, several of the main findings relating to multiskilling are relevant to more than one section. Therefore, ideas will be used in multiple chapters as necessary.

2. Background and Literature Search

2.1 Background

The construction industry in the United States has been characterized as an industry that undergoes little change. Comparisons between construction and other industries such as manufacturing show that there have been few innovations in work processes and practice theories in the last two decades. The construction industry has relied heavily upon the traditional methods of developing new projects and revamping old projects. These methods are very labor intensive, and it is not uncommon for the labor costs on a project to account for 30%-50% of the total project costs (Adrian 1987). However, even though labor accounts for such a large fraction of the job costs, there have been few changes in labor utilization strategies that improve the effectiveness of labor. In fact, many experts in the construction industry claim that the labor force on construction sites has become increasingly ineffective in the development and maintenance of projects (Halverson 1995). This decline in productivity is partially responsible for the rising project costs that have been seen in the last two decades.

Much research has been performed to attempt to isolate the causes of the productivity loss. Borcharding performed research that attempted to determine the factors that influence craft productivity on construction sites (1971). Others have also performed research using worker surveys, foreman delay surveys, work sampling, and other measuring techniques to identify the causes of the loss in productivity (Alfeld 1988; Rogge 1981). The result of many of these studies has been improvement programs that focus on inefficiencies on the construction site and in the communication process between upper management and the foremen and workers on the site. In recent years, attempts have been made to increase the productivity and safety of construction sites through automation and preassembly techniques, however, many of these attempts are in the developmental stages and are not in wide-spread use.

As important as the apparent loss of productivity are issues that surround the construction employee. Many sources state that there is a shortage of skilled construction workers in many areas of the country, and it is forecasted that the shortage may get worse in the coming years (Setzer, Bradford, and Krizan 1989). A portion of this shortage can be attributed to the loss of productivity on construction sites- as productivity decreases, more worker-hours are needed to perform the same tasks. Another portion of the worker shortage can be linked to the image of the construction worker that has been portrayed over the years. The construction worker is portrayed as a transient person that is a little • rougher• than the average working person in America. According to an article by Halverson, “[s]urvey after survey reveals that construction is perceived as a dirty, dangerous occupation, lacking in prestige and long-term opportunity” (1995). These survey results reflect the culture of the construction industry, in particular, its hiring and firing practices. Traditionally, the construction industry has suffered from a very unstable employment pattern in which many workers are repeatedly subject to hiring, layoff, and recall. The image and unstable employment pattern have resulted in a reduction in the amount of new entrants into the construction workforce. In addition, construction is now facing increasing competition from other industries for workers--this competition is also contributing to the labor shortage (Setzer, Bradford, and Krizan 1989; Maloney and McFillen 1987; Krizan, Winston, and Korman 1997).

Previous research (Sebastian and Borchering 1979; Alfred 1988) has also identified factors that affect the motivation of workers on construction sites. More important than the factors that motivate construction workers are the factors that demotivate workers. Demotivating factors identified include discontinuity of job assignments and a feeling of purposelessness due to idle time on the job site. Both of these demotivators negatively impact the attitude of the worker and act to lower his or her overall productivity.

Many construction trade workers also face the problem of short employment duration, frequent layoffs, and periods of unemployment between jobs because of the normal flow of work and the normal manpower fluctuations

experienced in the construction process. According to Maloney and McFillen in a 1986 survey of 404 open shop construction workers, the average employment duration for 1983 was only 42.1 weeks and the average number of layoffs for the last five years was 2.5. As a result, the net annual income for many construction workers is low.

Multiskilling may have the potential to address all of the above stated factors. With multiskilling, workers may expect to have longer employment durations, continuity of job assignments, and reduced idle time. Potential byproducts of multiskilling are increased efficiency, increased safety, lower personnel costs, and lower total labor costs (Current Practice Surveys 1996). The potential associated with multiskilling may make it a viable strategy for use on some construction projects. There are, however, some potential problems associated with the use of multiskilling. Issues relating to project owner acceptance, labor acceptance, program design, and licensing requirements must be addressed in order for a multiskilling program to be effective.

2.2 Literature Search

The literature search conducted as part of this research indicates that training and utilizing multiskilled workers is not a new idea. As early as 1982 The Business Roundtable recognized that rigid trade lines lead to inefficiencies on some jobs. According to the Business Roundtable publication *Exclusive Jurisdiction in Construction*, “changing skill requirements on small jobs and at the beginning and end of larger jobs requires the layoff of some workers and the hiring of others if rigid trade lines are observed. More flexibility of work assignment across trade lines would produce a more stable work force through a transfer of people within the project” (The Business Roundtable 1982). The publication states that combining trades into groups for the purpose of specific tasks would give the contractor the capability to assign the work in a more flexible, efficient manner. The publication provides an example of creating four trade groups (Mechanical, Electrical, Civil, and Support) to perform tasks on construction projects (The Business Roundtable 1982).

Evidence from the literature search indicates that multiskilling is being used in both the construction and manufacturing industries. Companies such as National Steel, Motorola, and Hoechst Celanese, and Rohm and Haas are using multiskilled labor strategies in some of their plants. Documented benefits presented in the literature include increased productivity, lower personnel costs, lower turnover levels, increased quality, and increased worker satisfaction (Denton 1992; Carmichael 1993; Alster 1989; Williamson 1994). Other potential benefits include smaller crews, shorter equipment downtimes, and increased earnings for employees (Williamson 1992). These articles also suggest that while using a flexible workforce trained in multiple trades is beneficial, there are problems associated with its implementation and sustainment. Problems cited in the literature include employee resistance and an increase in turnover in the initial implementation phases (Alster 1989; Denton 1992). Additional information from the literature search will be presented in Chapters 4 through 8.

2.3 Affiliated Research

Two other research efforts were also conducted in conjunction with the research reported here. One (RR 137-11) presents results from a project level analysis to investigate the potential economic ramifications of using different multiskilled labor strategies. This research effort used the Construction Industry Institute (CII) Model Plant as a base project on which to test different multiskilled labor strategies. The CII Model Plant project was completed by CII in 1986 to provide a platform for other research topics related to industrial plant construction. As a part of the Model Plant research, a realistic construction schedule and the needed quantities of materials, equipment, and labor were estimated for a grass-roots petrochemical facility. Staffing requirements for each trade were determined from the previously determined labor estimates. The staffing requirements and schedule were subsequently loaded into a scheduling software package. Using the labor resource loaded schedule, the number of workers could be determined for each week of the project. Four multiskilled trade groupings were defined and loaded into the

schedule to determine the differences in staffing levels required for each multiskilled strategy. Each of these strategies was compared to a baseline strategy that parallels the traditional single skilled strategy. The multiskilled strategy that performed the best was the use of four trades - very similar to the one suggested in the 1982 Business Roundtable publication discussed above. The strategy resulted in a 35% reduction in needed project workforce and a 47% increase in average employment duration.

The research efforts also resulted in an economic equation that could be used to estimate the potential savings associated with the use of a multiskilled strategy when compared to the traditional labor strategy. Results indicated that the use of four multiskilled trades could potentially result in 5%-19% savings in total project labor costs.

The other (RR 137-13) reports research efforts to identify key issues that must be addressed in the implementation of a multiskilling program. Data from RT 137 and literature sources was used to develop a conceptual model for the implementation process. The final result was a 12 step implementation process that identifies key areas and steps that must be addressed in a multiskilling implementation process.

3. Research Methodology

3.1 Introduction

Three primary sources of information were used in the research effort reported in Research Report 137-11, published literature, and current practice surveys. The information from the CII Research Team provided current human resource management practices and contacts for the current practice surveys. The research team also supplied an update report on multiskilling implementation efforts at a Texas process facility. The research team was comprised of upper level management from CII member companies, a faculty researcher from the University of Texas at Austin, and student researchers. The member companies of CII represent some of the major contractors and users of construction services in the United States, therefore the data from this source reflected both an industry and an academic perspective on the concept of multiskilling.

Information from articles and books provided documented examples of current multiskilling programs including benefits, impediments, and implementation issues; however, little in-depth or supporting data was available directly from these sources. Previous construction research provided insight into worker attitudes, a means of quantifying potential increases in productivity from the use of multiskilling, and sources of potential improvements through the use of multiskilling. This research provided actual data relating to worker performance on construction sites.

The final source, current practice surveys, provided detailed information from current projects that are using multiskilling. This data represents the experiences of project managers and human resource officers with multiskilling. The three different sources of data worked to complement each other and each provided important information that was not available from other sources.

After the data from the three sources was gathered, it was organized into benefits, impediments, and limitations relating to the use of multiskilling. These results will be presented in Chapters 4 through 8 which presents the research results. The research results chapters are organized by concept rather than by information

source. This organizational scheme allows common concepts which were addressed by more than one source to be combined into one unified section that presents the concept and the supports and criticisms of the concept. The following sections of this chapter will provide more insight into the four sources of information.

3.2 Literature Search

A literature search has been conducted as part of the research effort. The literature search was performed in an effort to identify current documented practices relating to multiskilling and other related practices. In performing the research, searches were made using the University of Texas Library System Database UTCAT and Internet search engines on the World Wide Web. Concepts relating to multiskilling, productivity, job flexibility, and worker satisfaction were identified as contributory sources to the current study.

The information collected from the literature review can be divided into two main groups:

1. **State of the Construction Industry**

This group of information includes information on labor issues, productivity decline, and increasing job costs. The major contribution of this information to this report is the identification of current problems in the construction industry that can possibly be eliminated with the use of a multiskilled labor strategy.

2. **Trade Flexibility and Multiskilling**

This group of sources presents alternative labor strategies that allow for cross-trade training and worker assignment flexibility. Some of these publications discuss multiskilling directly, while other publications only advocate a labor system that utilizes employees with multiskill capabilities or the use of multiskilled teams. These articles provide industrial and construction experiences with multiskilling including the basic benefits and barriers to implementation that have been experienced due to multiskilling implementation.

Web pages found on the Internet are also included in the literature search. The information found on these web pages generally parallels the two categories of information found in the published articles with two major additions. One major type of information that was more prolific on the Internet was information relating to implementation of multiskilling programs. Different company implementation strategies are found on the Internet, as are details on training programs which train multiskilled workers. Another type of information more readily available on the Internet was multiskilled job descriptions and job advertisements seeking multiskilled employees. Information from the Internet is used in this report to add support and validity to the multiskilling concept, and as added support for the benefits, impediments, and limitations of multiskilling applications.

It should be noted that information from the Internet has its advantages and disadvantages. The literature search information from the web has one major advantage over conventional written publications- accessibility. Information from the country and the world is readily available on the Internet. This provided the opportunity to find and use information on multiskilling that is written by actual companies which have implemented the strategy. It also allowed the use of information from other universities and other countries that could not be found through conventional literature searches. The use of the Internet also has its disadvantages as well. The first disadvantage of the web is that companies frequently update their web pages and often totally remove web links. Therefore, what is listed as a reference in this report may not be available if someone wishes to see the web page in the future. The second disadvantage is that currently there is no standard format for referencing the web page. References to information on the Internet in this report will be documented by the web address and the date that the page was last updated. Where possible, the original publication has been determined and used to reference the information contained on the web page.

It should also be noted that the literature search for this report was limited in scope. Therefore, the literature search does not represent an exhaustive effort, but rather a scaled effort that gathered information that was readily available on the

subject through searches on common sense topics and keywords. There is a good possibility that there is more literature information available that might either support or criticize the multiskilling concept. However, due to time and logic constraints, the author was unable to find and use these sources.

3.3 Current Practice Surveys (Phase I)

3.3.1 Introduction

A portion of the current research effort included gathering current practices used in current construction multiskilling programs. Through this effort, a portion of the industry's reaction to multiskilling efforts was obtained. The surveys were used to gather information on multiskilling including implementation issues, project benefits, worker benefits, impediments, and participant reaction to the program. Little hard data was obtained, however. The following sections will examine the research effort, describe the research results, discuss the analysis of results, and address the use of this information in the report.

3.3.2 Methodology

One of the most important steps in any type of survey is the development of the questionnaire. The questionnaire used in the current research was developed by CII Research Team 137. The decision was made by the author to use the aforementioned survey as a base set of questions for the surveys, and to supplement them with additional questions as needed. It is important to note that two of the participants, Alan Burton of Cianbro Corporation and Dr. Rich Shieg of Shieg and Associates, were surveyed without the questionnaire as a guide. Alan Burton was interviewed prior to the decision to conduct the structured surveys, Dr. Shieg was a researcher who had previously performed work relating to multiskilling (Burton, 1996; Shieg 1996).

The participation of the research team was very important to the success of the surveys, since contact names for the interviews were supplied by members of the

team. Members of the team whose companies used multiskilling supplied the names of project managers who had experience with multiskilling labor strategies. Other members of the team provided contact names at other companies and agencies such as the Associated Builders and Contractors through which additional participants were found. One of the research team members was also interviewed and is included in the research because of his experience as a human resources officer in a company that utilizes multiskilled labor strategies.

Two different methods were used to conduct the current practice surveys. The majority of the surveys were performed via phone interviews with the interviewee. The decision was made to conduct phone interviews instead of mailed surveys in order to expedite the process and to allow for more free flowing discussion. The interviewee was contacted to schedule a time for the interview, and to ask his permission to tape the interview. Taping allowed the interviewer to concentrate on the conversation and ask questions that were related to the topic, but that were not included in the hard copy of the survey. Directly after initial contact with the interviewee, the interviewee was faxed a copy of the questionnaire as an introduction to the types of questions that would be covered in the interview. All of the participants were asked a core set of questions. For some of the interviews, additional questions were asked that were related to a previous answer of the interviewee. In the one case where the participant was not available for a phone interview, the second method was used (Dambrino 1996). The second method involved faxing a copy of the survey to the participant, the participant filling the survey out and faxing the survey back. Some of the participants requested that the interview not be taped, and in these cases notes on the conversation were taken in shorthand as the interview progressed.

After each interview was completed, a transcript of the interview was made using either the tapes of the interview or the shorthand notes that were taken on the interview. The transcripts used the exact words of the interviewee in order to maintain the true sentiments of the interviewee. Each transcript was subsequently faxed back to the interviewee for any corrections or additions. None of the interviewees sent back corrections or additions to the transcripts. The transcripts are

included in Appendix C and the interview tapes are stored at The University of Texas to aid in future research.

3.3.3 Survey and Participant Breakdown

A total of 14 current practice surveys were conducted. Of these 14, 13 were phone interviews and one was faxed, filled out, and faxed back. Of the 13 phone interviews, 10 were recorded with the interviewee's permission, and three were performed without taping. Eleven of the interviews were performed with the structured questionnaire as a guide and the remaining three were general conversations with parties informed on multiskilling. The following table includes a list of interview participants, their companies, and their job titles.

Table 3.1 Interview Participants, Companies, Job Titles, and Project Characteristics

Name	Company	Job Title	Contract	Labor Type
Alan Burton	Cianbro	Safety and Human Resources Director	Capital	Open Shop
Nate Weston	Cianbro	Project Superintendent	Capital	Open Shop
Chuck Rounds	Cianbro	Project Manager	Capital	Open Shop
Terrance Mason	Beacon Construction	Human Resources Representative	Maintenance	Open Shop
Don Gulloitt	Watkins/Inland Construction	Field Superintendent	Maintenance	Union and Open Shop
Dave Leavitt	Cianbro	Project Manager	Capital	Open Shop
John White	Watkins/Inland Construction	Site Manager	Maintenance	Union
Parker Hadlock	Cianbro	Project Manager	Capital	Open Shop
Richard Dambrino	BE&K	Testing/Training Manager	Maintenance	Open Shop
T.W. Wallace	BE&K	Maintenance contract manager	Maintenance	Open Shop
Mark Massey Dick Jarvis	Watkins	General Supt. Work Order Supt.	Maintenance	Open Shop
Mac Cooley	Watkins/ Inland Construction	General Supt.	Maintenance	Open Shop
Roy Swindal	Masonry Arts, Inc.	President	Capital	Open Shop
Dr. Rich Shieg	Shieg and Assoc.	President	N/A	N/A

The variation of job descriptions and companies added to the breadth and depth of the information gathered. Both upper and middle management personnel are represented in the list of interview participants; job titles range from President, to

Human Resources Officer, to Project Manager, to Superintendent. This variation in job titles is important because the insight and opinions of different organizational levels is represented. There is also considerable variation in the companies represented by the interview participants. Six different companies are represented in the anecdotal surveys.

There was also a variation in the project characteristics for the projects with which the interview participants were associated. Table 3.1 also presents the breakdown of the types of contracts and labor force used on the projects represented in the current practice surveys.

It is important to note that survey participants indicated that both union and non-union labor forces were being used on projects using multiskilling. One of the survey participants commented that both union and non-union forces were working side by side on his project with no problems (Guillot 1996). The three projects that used union labor either hired all personnel through one union, or operated under the General Presidents Maintenance Agreement (GPMA). GPMA agreements are multitrade agreements which “eliminat[e] many of the restrictive work provisions contained in the local construction agreements and [give] the employers latitude to assign work in a more economical manner” (Stokes 1980).

3.3.4 Analysis of Surveys

As mentioned above in section 3.3.3, the structure of the current practice surveys varied between participants. Some of the participants were asked questions that were not asked of other participants, and some of the participants offered information that other participants did not offer. Therefore, a true statistical analysis of the current practice data was not possible, however, a simple organizational analysis and frequency chart for the answers and themes covered in the surveys was conducted. For this analysis, the interview participants’ answers were divided into categories or major themes. The major themes used in the analysis are as follows:

- worker benefits

- project and owner benefits
- barriers to implementation and limitations
- problems associated with multiskilling
- compensation strategies
- implementation strategies and usage patterns
- training
- recruitment

The method chosen for quantifying an affirmative response to a specific idea was subjective. Each participant gave his response in his own words, therefore subjective judgment was used on the categorization of ideas. The final product reflects the decision to list an idea as it was mentioned by the first person, and, if an additional participant gave an answer that was the same or very similar to one already listed, the chart shows that the latter participant also mentioned the idea in the interview. It is also important to note that some of the ideas presented by one interview participant were contradicted by other participants. The chart only lists 13 of the 14 interview participants because the interview with one of the participants, Dr. Rich Shieg, did not parallel the questionnaire at all. The organizational analysis and frequency chart for Phase I is included in Appendix A.

3.3.5 Use of Current Practice Surveys in Report

There is no one section in the research results section that is reserved for the results of the current practice surveys. Instead, the results from the surveys are used as needed in each of the sections and subsections of the research results chapter. The information from the current practice surveys is presented in two main ways:

1. The presentation of general ideas and trends from the surveys as a whole
2. Actual quotes and excerpts taken from the interviews.

Whenever an idea is best attributed to one of the survey participants, the participant's name is referenced. When an idea is representative of several of the surveys, reference is made to the survey results.