



**MULTISKILLING LABOR STRATEGIES
IN CONSTRUCTION:**

**IMPLEMENTATION OF MULTISKILLING 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**

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Table of Contents

List of Figures.....	iii
Executive Summary.....	iv
Abstract	vii
1. Introduction	1
1.1 Objectives.....	1
1.2 Background	1
1.3 Methodology.....	3
2. Background	4
2.1 Multiskilling in the Manufacturing Industry	4
2.2 Potential for Multiskilling in Construction	6
2.3 Current Multiskilling Practices in the Construction Industry	9
2.4 Implementation Issues	11
2.4.1 Human Factors	11
2.4.2 Upper Management Commitment	11
2.4.3 Needs Assessment	11
2.4.4 Planning.....	12
2.4.5 Communication	12
2.4.6 Rewards and Recognition.....	13
2.4.7 Documentation	13
2.5 Typical Implementation Strategies	13
2.5.1 Single Effort.....	13
2.5.2 Incremental Steps	14
2.5.3 Pilot Project.....	14
3. Methodology.....	15
3.1 Research Scope	15
3.2 Overview of Research Tasks.....	15
3.3 General Implementation Guidelines Development.....	16

4. Implementation	17
4.1 General Implementation Guidelines	19
4.1.1 Identify Champions.....	19
4.1.2 Stakeholder Support.....	19
4.1.3 Steering Committee.....	19
4.1.4 Skill Grouping Opportunities	20
4.1.5 Recruiting Strategy.....	23
4.1.6 Training Strategy.....	24
4.1.7 Compensation Policy	26
4.1.8 The Implementation Plan	28
4.1.9 Execute Plan	28
4.1.10 Possible Improvements	29
4.1.11 Documentation	29
4.1.12 Decision	30
4.2 Multiskilling in Maintenance Operations	30
4.3 Multiskilling in New Construction Operations	31
4.4 Possible Barriers to Implementation	32
5. Conclusions and Recommendations.....	34
5.1 Conclusions	34
5.2 Recommendations.....	35
Appendix A: Multiskilling Survey Questionnaire Results	37
Appendix B: Multiskilling Economic Model	
Graphical Representation	40
Appendix C: Expected Percent Savings	41
Bibliography	43

List of Figures

Figure 4.1	Multiskilling Implementation Guidelines.....	18
Figure 4.2	Current Practice Skill Combinations Summary Matrix	22
Figure 4.3	Self-Managed Team Approach for On-The-Job Training	25
Figure 4.4	Development of Multiskilled Personnel Process	26
Figure 4.5	Plan-Do-Check-Act Cycle	29

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 which identified four multiskilled crafts groupings. The four multiskilled crafts included civil, electrical, mechanical and a general support craft which 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 was 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 workforce 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.

The research efforts were conducted in three separate phases. Phase I investigated experiences with multiskilling in the construction industry to determine actual and perceived benefits, impediments, and limitations to the use of multiskilled labor strategies. Phase II included the project level analysis of different multiskilled strategies. Phase III involved determining key issues that must be addressed in the implementation of a multiskilling program. This research report focuses on Phase III of the research and discusses the implementation of multiskilling in the construction industry.

Abstract

The construction industry is currently experiencing and expects in the near future skilled labor shortages. Multiskilling is being studied as a labor strategy to deal with the foreseen labor shortage. Previous studies have proved that using multiskilled labor reduces the total number of workers needed and increased productivity to perform a construction project. Benefits to the construction worker are longer periods of employment, potential wage increases, better marketability, and more interesting work.

A literature review of existing multiskilling applications in the manufacturing and construction industries is included in this research. A series of implementation steps and guidelines to developing a multiskilled construction labor force is presented. Possible barriers to implementation are also discussed.

1. Introduction

1.1 Objectives

The goal of this research was to provide preliminary guidelines and best practices leading to a successful implementation of a multiskilling strategy on maintenance and capital construction. The main focus on multiskilling applications was on the industrial and commercial segments of the construction industry.

Multiskilling has been defined as a labor utilization strategy in which workers are skilled in more than one trade which allows flexibility on a project and within an organization. “It is a managerial strategy based on developing competency within the workforce and the full utilization of capabilities”.²

This research is the product of studying past implementation strategies and plans in the construction and manufacturing industries. An extensive literature review as well as interviews with individuals in companies that are developing a multiskilled labor force are the basis for this report. These interviews have been conducted by the Construction Industry Institute’s Research Team 137. Additional data must be collected to confirm this report’s findings.

1.2 Background

Multiskilling craft capabilities in the past few years have been gaining strength in the manufacturing industry. Flexibility in the work load, safer and more productive employees, and lower turnover and absenteeism rates have been results of using a multiskilled manufacturing labor force. However, the concept has not been implemented to the same extent in the construction industry. It is characteristic of the construction industry to have a specialized work force. A specialized worker is one who has proficient skills in only one trade which allows little cross trade flexibility for his job assignments.

² Burleson, Rebecca, *An Analysis of Multiskilled Labor Strategies in Construction*, dissertation. The University of Texas at Austin. December, 1996. p. 14

Recent studies done by the Construction Industry Institute (CII) and The University of Texas at Austin have identified the potential benefits of implementing a multiskilling strategy. So far these studies have focused on determining these benefits on a project level using the CII Model Plant as a basis for comparison. Several theoretical skill groupings were used to develop multiskilling strategies and determine which ones are more feasible than others. An economic model was developed to estimate the impact that implementing a multiskilling strategy may have on the bottom line of a construction project³. As a general conclusion, Research Team 137 identified that multiskilling is a promising strategy that needs additional research and individual company consideration.⁴ Some specific benefits on a project level identified were: reduced costs in direct wages, improved project safety performance, reduced worker recruiting, savings on payroll taxes and insurance, reduced total number of hires and fires, and a more flexible work force.⁵ Several worker benefits such as increased earning potential, increased employment duration and marketable skills were also identified by the team. It was also noted that project and company systems must change to support and facilitate multiskilling as a competitive strategy.

Research Team 137 identified that several construction companies have already started to successfully implement multiskilling. Interviews with individuals associated with multiskilling programs in these companies were conducted. As a result of the interviews it was noticed that so far most applications of multiskilling have been on maintenance construction work where the contractor is guaranteed “continuous” employment year round.⁶ The trade groupings used by these contractors were similar. Crafts are usually multiskilled in either the electrical, mechanical or civil general trades. Two main implementation guidelines were

³ Burleson, Rebecca, *An Analysis of Multiskilled Labor Strategies in Construction*, dissertation. The University of Texas at Austin. December, 1996.

⁴ Notes from Research Team 137 meeting in Austin, January 27, 1997

⁵ Burleson, Rebecca, *An Analysis of Multiskilled Labor Strategies in Construction*, dissertation. The University of Texas at Austin. December, 1996 p. vi

⁶ RT 137 Current Practice Survey. Transcripts of the interviews may be found in the Research Team’s Progress Reports.

observed. The first one is to recruit employees specialized in one trade and then have them learn other trades on and off the job. The other is to have new employees enter the company as a general purpose construction worker where they will learn skills that are common to all trades. Once the “multiskilled” helper has mastered the basic skills, he or she will advance to a craftsman level in specific skills that complement each other. Either way, the end result is a flexible, multiskilled labor force that is very helpful for maintenance operations.

1.3 Methodology

The first stage of this research was a literature review based on previous studies of multiskilling applications in the manufacturing industry and its potential for the construction industry.⁷ Articles on multiskilling strategies in both industries were collected and compiled to identify and list current practices and develop feasible guidelines for implementation on a construction environment. Parallel to the literature review, an analysis on the current practice survey by Research Team 137 was conducted.⁸ This survey consists of a series of interviews with individuals who are currently implementing a multiskilling program in their company. From these interviews, several approaches to implementation were noted. All of the approaches were considered feasible since they are being implemented successfully.

Based on the literature review and the current practice survey, a series of guidelines for implementation on maintenance and capital construction work were developed. These guidelines were reviewed by Research Team 137 members on their monthly meetings for observation and validation based on their significant combined experience in construction operations. Once the guidelines were approved by the research team a series of conclusions, observations and recommendations concerning implementation of multiskilling in construction were developed.

⁷ Burleson, Rebecca, *An Analysis of Multiskilled Labor Strategies in Construction*, dissertation. The University of Texas at Austin. December, 1996

⁸ RT 137 Current Practice Survey.

2. Background

Multiskilling has been widely implemented in the manufacturing industry. However it hasn't been implemented to the same extent in the construction industry. Within the construction industry, research to date has found that multiskilling labor strategies have been used in maintenance operations more than in capital or new construction.⁹

2.1 Multiskilling in the Manufacturing Industry

“Training employees in several jobs can help companies respond to the market faster. It also increases efficiency, quality, productivity and job satisfaction”.¹⁰ Recently the manufacturing industry has experienced benefits from multiskilling their workforce. Multiskilling has been a shift from traditional management, which emphasized on equipment use optimization and work specialization, to a management strategy that focuses on the maximization of labor capacity.¹¹

Multiskilling is being used in the manufacturing industry as a tool for improving productivity through the skills development of the labor force. Workers are trained to perform several tasks that involve knowledge of various skills. Through this training workers are expected to learn new skills in addition to maintaining their proficiency in the skills previously mastered. The ability of laborers to perform several skills has produced a workforce that can adjust to flexible work assignments, thus reducing idle time and improving productivity.

The major benefits that multiskilling has brought to the manufacturing industry are:

- Improved employee morale
- Improved speed and efficiency

⁹ RT 137 Survey of current multiskilling practices in the construction industry. The survey consists of 16 interviews with professionals involved in multiskilling projects. Transcripts of the interviews are available in RT 137 Progress Reports V, and VI.

¹⁰ Alster, Norm. “What Flexible Workers Can Do” Fortune Magazine, February 13, 1993.

- Improved relationships with and between employees
- Flexible workforce
- Reduced total workforce needed
- More interesting work to employees (job enrichment)
- Lower turnover
- Improved job awareness

The above benefits have led the manufacturers implementing multiskilling to increase the quality of their products as well as increase their profits through better productivity.¹²

Several approaches to developing a multiskilled labor force have been observed in the manufacturing industry. Some companies such as Motorola have reduced the number of skill trade categories by cross-training their employees in order to have them be proficient in several trades. Through multiskilling, workers are responsible for performing 'whole' work packages, thus making them accountable for the end product. This has been introduced in manufacturing by Total Quality Management (TQM) programs. The teamwork principles suggested by TQM have been an effective approach to implementing multiskilling.¹³ Multiskilled teams have been empowered to make decisions concerning the methods to be used for manufacturing. Work teams usually develop more productive work systems than the ones developed by upper management.¹⁴ Multiskilled workers have helped companies solve critical quality problems.

In the fast paced world economy where technological change, global competition, and shrunken product cycles have become the norm, multiskilling has been the human side of the answer to being competitive. It makes sense to develop a labor force that can rapidly adapt to unpredictable developments. Multiskilling has helped companies enhance a just-in-time system in which production will quickly

¹¹ Bassett, Glenn. *Strategies for Today's Project Shop* Quorum Books, New York, 1993.

¹² Denton, Keith. "Multi-skilled Teams Replace Old Work Systems" HRMagazine, September 1992. Vol. 37. No 9.

¹³ Denton, Keith. "Multi-skilled Teams Replace Old Work Systems" HRMagazine, September 1992. Vol. 37. No 9.

¹⁴ Semler, Ricardo. *Maverick* Warner Books. New York, NY 1995

adapt to comply with market demand, thus reducing large quantities of inventory and work in progress.¹⁵

Some manufacturing companies have developed a skill-based pay program in order to reward the multiskilled laborer for learning additional skills. This skill-based pay rate is based on the number of skills one masters as well as which skill is being performed by that individual. In addition to the increased earnings, successful implementation has been accompanied by crew recognition programs. Pay incentives and the prospect of more interesting work has been valuable in recruiting during labor shortage periods.¹⁶

Training costs as well as some worker resistance have been impediment to multiskilling implementation. Most often the savings from multiskilling outweigh the initial training costs. Worker resistance has mostly come from trade unions who fear for guaranteed work for their members if the trades boundaries are brought down. Also middle management supervisory personnel resist the change to multiskilling because worker teams may be capable of supervising effectively their own work.

Previous literature research found that multiskilling increased the use of new technologies as well as the level of innovation within organizations.¹⁷ It is believed that multiskilling will continue to grow within the manufacturing industry as well as in other industries.

2.2 Potential for Multiskilling in Construction

The success of multiskilling applications in the manufacturing industry has been a prime motivator to implement the strategy in the construction industry. The potential benefits that may be acquired by the construction application of multiskilling are lower overall workforce needed, lower turnover, increased productivity, and safer employees.

¹⁵ Goldratt, Eliyahu. *The Goal: a Process of Ongoing Improvement*. Crouton-on-Hudson, New York, NY., 1995

¹⁶ Alster, Norm. "What Flexible Workers Can Do" *Fortune Magazine*, February 13, 1993

¹⁷ Burleson, Rebecca, *An Analysis of Multiskilled Labor Strategies in Construction*, dissertation. The University of Texas at Austin. December, 1996.

The construction project environment is experiencing and expects shortages of skilled labor in the near future. The number of new entrants to the construction industry has been declining over the past four years. In the coming years it is expected that not enough skilled laborers will be available to meet market demand.¹⁸ Multiskilling may help manage this problem by reducing the number of laborers needed to complete a project. Also, multiskilling promises new entrants more employment stability as well as more interesting and challenging work which may make a construction career more appealing to potential entrants. The reduced number of total workforce needed and the potential increase in new entrants are benefits concerning labor shortage expectations, but the construction industry may expect other benefits from developing a multiskilled labor force.

Benefits other than those dealing with labor shortages are improved safety, quality and increased productivity. Laborers will be employed at the same project site during longer periods of time. Safety records indicate that the longer a person is on the same project site, the less likely he/she is to be involved in an accident.¹⁹ People that have been longer on the site have a better understanding of the work process and recognize its risks. Quality improvements may be the result of the fact that multiskilled workers are proficient enough to supervise each other's work as well as their own. Also, since the same worker or work team is responsible for a tangible finished work packet they will be held accountable for its quality. Worker accountability for work performed will lead to better quality. Productivity improvements are foreseen due to several factors. Since workers are capable of performing several tasks less idle time is expected as a result of work flexibility. Also the expected quality improvement may lead to less overall rework. In addition, a more knowledgeable worker may select better work methods and innovate new ones to improve productivity.

The multiskilled construction worker may enjoy additional benefits that the single skilled worker lacks. Multiskilling benefits for the construction worker are longer term employment which potentially leads to less time unemployed, potential

¹⁸ Krizan, William. "Labor: Stability Survives Hiring Boom" ENR v 223 n 37 p 35, September 30, 1996.