

# **USE OF THE DELPHI METHOD TO IDENTIFY AND ANALYZE INCENTIVES FOR US HIGHWAY CONSTRUCTION WORKERS**

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Crew leaders and foremen on construction job sites are skilled individuals that are dwindling in numbers due to the push on students throughout their secondary schooling to attend college, in addition to other economic factors. The focus of this research is to determine what incentives construction companies implement in order to retain, motivate and increase the productivity levels of their skilled crew leaders and foremen. This study utilizes the Delphi method, which consists of questioning a panel of experts in a series of rounds—with the summaries of responses from each round made available to each of the experts—until a consensus is reached. The Delphi method allows a researcher to utilize the expertise of a smaller population sample than traditional statistical methods, but has gained worldwide acceptance as a substitute for some of those traditional methods. Each construction company operates in a unique, independent manner as they compete to attract and then retain these valuable workers. The main goal of this research is to investigate this as an economic issue, and determine if offering more, or larger, incentives to the skilled crew leaders and foremen is worth the additional cost. The purpose of this paper is to describe how the Delphi Method was utilized to accomplish this.

*Keywords:* Employee retention, Contractors, Heavy, Civil.

## **1 INTRODUCTION**

In the construction industry, it is critical that general contractors consistently work well with owners and fulfill their contractual requirements, providing a high quality product by the agreed completion date. In order to meet these demands in such a highly competitive industry, while also turning a profit after project completion, these companies must hire highly skilled workers throughout all career levels of the company and maintain a positive reputation in their respective markets. Having such highly skilled workers throughout the company, especially the hourly workers in the field, makes the company productive and enables these client-owner relationships to form. Forming these relationships attracts repeat and new business for the construction company, earning the company more revenue overall.

Every year, construction companies around the nation contribute a portion of their profits to the hard working employees that enable the company to operate efficiently and effectively in their respective sectors. Most of these incentives are distributed to the salaried individuals within the company and are usually weighted in monetary value

based on the specific individual's performance. In addition to these employees, it is also important to recognize the individuals that are compensated on an hourly basis due to their high level of involvement in the field operations throughout the construction process, such as the foremen and skilled crew leaders that self-perform work throughout the different trades. Without highly qualified and skilled field workers, the productivity of the construction process is jeopardized, which could result in excessive costs for the construction company or a breach of contract with the owner.

## **2 RESEARCH OBJECTIVES**

The purpose of this research is to compare the differences between the incentives upper management offers the different levels of employees throughout multiple construction companies, with the goal to determine whether or not the foremen and skilled crew leaders are compensated according to their level of involvement and control of the construction process. Prior research has shown that it is important for highly productive workers to be recognized and rewarded in some manner for their accomplishments in many different industries, which contributes to their overall job satisfaction and financial stability; therefore, this study will focus on how this concept is applied throughout the construction industry, specifically the skilled crew leaders and foremen. These incentives can come in many forms, such as cash bonuses, stock options, health benefits and job-specific training, which are all used to retain, motivate and increase the productivity of the employee. This research will also focus on the views that upper management personnel have towards their foremen and skilled crew leaders, as well as their reasons for offering, or not offering, certain types of incentives.

## **3 RESEARCH MEHODOLOGY**

This research was conducted using a procedure known as the Delphi method, which produces statistically significant results in a manner different from conventional statistical methods. The Delphi method is a highly structured and systematic technique of communication that allows interaction between the participants anonymously in order to accumulate expert judgement on a topic, or phenomenon, where there is a lack of knowledge regarding the problem. This research method has been proven to work well when the end goal for the researcher is to better understand a problem, determine a solution, or develop forecasts of what could happen if the problem is left unsolved (Linstone and Turoff 1975).

To implement the Delphi method most effectively, all identities of the participants are to remain anonymous, which allows them to better express their opinions without feeling any pressure from the group to conform to the other respondents' answers. An identical questionnaire is also sent out to all participants in order to collect data that can be compared and analyzed properly. Once all of the respondents return their questionnaires, a summary of the responses are then returned to each of the experts in order for them to examine all of the different points of view regarding the topic. The experts are then asked to provide feedback pertaining to the responses from the summary in order to determine what was disagreed upon. If a consensus is not reached, a new questionnaire is compiled and sent back out to each of the respondents in order to further research the issue. This process is repeated until a conclusion can be drawn

(Skulmoski *et al.* 2007). These factors were all taken into account throughout this research to provide relevant results that can be used to draw accurate conclusions.

The members of the panel that completed the questionnaire are regarded as experts in the heavy construction industry. Due to the prescribed rules outlined in the Delphi method, a minimum number of six respondents were sought for the expert panel in order to make this research statistically significant, yet eight ended up participating. This expert panel was composed of individuals from a mix of small, medium, and large contracting firms, that all operate in the heavy construction industry, their companies ranging in annual revenue from roughly \$100,000,000 to nearly \$11,000,000,000 in 2014. When determining which companies to target in the medium to large range, the Engineering News-Record's "Top 400 Contractors" list was referenced (2014).

Each of the experts from these companies were required to have a minimum of 15 years working experience and have worked in the field at some point in their career. The panel for this research consisted of two project managers, three superintendents, two presidents, and one business development manager.

## **4 RESULTS**

### **4.1 Round 1 – Respondent Answers**

This study, composed of 11 total questions, focused on the labor trends in the construction industry and the incentives companies provide to retain, motivate, and increase the productivity of their skilled crew leaders and foremen. The results of this study, pertaining to the first round of questions that were given to the panel of eight respondents, are as follows:

#### **4.1.1 Questions 1-3**

The first three questions of this study pertain to the recent trend in the decline of skilled crew leaders and foremen available, the experiences that each of the respondents have faced finding such workers for their jobs, and the major contributing reasons for these shortages, respectively. All eight respondents "highly agreed" or "agreed," that there is a problem with the construction labor force and the decline of skilled crew leaders and foremen available. Seven of the eight respondents have faced the issues listed below either "often" or "very often" in attracting / retaining workers, while one respondent "rarely" faced these issues. The respondent that rarely saw this type of problem explained in greater detail that their company does a significant amount of in-house training and promoting from within, which helps them counter this problem. The respondent further explained that they move their foremen from project to project and "rarely depend on local talent at the foreman level."

Reasons for the shortage of skilled construction workers is detailed in the literature (Minchin *et al.* 2016). The list of reasons below was derived from the respondents as to why they felt there is currently such a large shortage in the labor force throughout the construction industry.

#### **4.1.2 Question 4**

The fourth question of this study focuses on whether or not the panel of experts noticed much of a skill/productivity level gap between the younger generations (millennials) of

laborers versus the older generations (baby boomers). One of the respondents pointed out that younger individuals may not arrive with the necessary, skills but they “definitely have the ability to learn and acquire them at a quicker rate” than older individuals. Another replied “Blue collar work is portrayed as an ‘if you can’t do anything else’ career.” Many school systems have eliminated “trade” or “shop” classes, so most young workers have no experience, unless they had a summer job with a home builder or a landscape company.

#### **4.1.3 Question 5**

This question, dealing with the percentage of the work in this sector of the industry that is self-performed by individuals working for the general (prime) contractor, was included in order to validate that each of the companies hired a large number of in-house crew leaders and foremen. The smallest of the companies researched reported that all foremen and crew members are in-house. Their foremen are typically responsible for anywhere between one to six laborers, depending on the job size. Larger companies noted that “the work force percentages vary significantly from discipline to discipline,” which relates to the specific scopes of work performed. Most civil work is 70-80% self-performed, but can be dictated by the state where the work is being performed. It was also noted that general contractors on the commercial side of the industry tend to self-perform roughly 5% of the work under contract, with the rest being subcontracted out, in order to show the stark difference between the different sectors of the construction industry.

#### **4.1.4 Question 6**

The sixth question focused mainly on whether or not the companies researched offered any types of incentives to the in-house labor force for self-performed work, since these firms performed the majority of their work themselves. “Best Quality Crew of the Month” or “Safest Crew of the Month” rewards, Lunches or barbeques, T-shirts, hats, or other company merchandise, Group milestones/productivity goals, Profit sharing plans, and Bonus programs are popular ways to reward excellence.

The company that noted utilizing a bonus program was one of the smaller firms that can keep track of these employees easier and “knows who is really contributing to the bottom line and who is just collecting a paycheck,” which is reflected in the bonus, if even given. This could be measured by schedule performance or man-hour performance. The incentives given to the in-house workers are typically dispersed on a case-by-case basis, and are typically determined by the project manager on the jobsite.

#### **4.1.5 Question 7**

The seventh question of this questionnaire pertained to whether or not safety was implemented as an incentive or not for the labor force and gave more insight into some of the responses from the previous question, with a 50/50 split between the respondents’ answers. Half of the companies researched gave incentives to their employees for upholding a high level of safety throughout each project, especially if zero accidents were recorded. The safety-based incentives varied from barbeques, or other types of lunches paid for by the company, to a percentage of their year-end bonus

based off of the employee's safety record for the entire year, but this was limited to only the foremen and above for the bonus system. The other half of the respondents noted that they do not offer incentives for safety due to the fact that OSHA feels as if "safety incentives offered will only keep the work force from turning in or admitting to any incident in order to receive the reward."

#### **4.1.6 Questions 8-10**

These questions focused on what types of incentives each company offers their labor force that solely focus on increasing the productivity levels of these workers, as well as the frequency these incentives are given, such as time-related or milestone-based incentives.

Specifically in regards to productivity, three of the respondents offer their labor force incentives that focus solely on productivity, which are predominantly milestone-based or determined by the productivity of a specific operation. One of the respondents, whose company offers these incentives, explained that they are not offered to all employees or on all projects, rather "individual projects can develop incentive programs for particular components of the job to ensure the success of that work" specifically. Another respondent noted that their labor supervision receives annual bonuses based on productivity, which is a cash-based incentive. This respondent noted that their company offers a pay incentive typically when their projects enter their final stages, explaining that the employees are offered "end of job bonuses if they stay until the project is no longer in need of their services," which is directly tied into their "safety and quality performance until the end of the project." The remaining respondents did not offer their labor force productivity-related incentives, or stated that there was "nothing official" for their company.

In regards to the expert's personal preference as to which incentive types they prefer to offer their labor force, in order increase their productivity, the responses were very similar to the incentives that they felt best motivated them. These incentives included bonuses, extra hours, recognition, pay raises, positive working environments and friendly competition between crews for awards.

#### **4.1.7 Question 11**

The eleventh question of this questionnaire pertained to the different incentives that the experts felt are the best motivators for the labor force. Four of the respondents noted that for their employees, they have noticed that they respond best to monetary, or cash-based, incentives. Of those four respondents, one of them also noted that "enjoying the work you do" is important as well. The other respondents all noted that recognition and respect in the work place are crucial motivators for these employees as well. Recognition was noted as a good motivator because it shows that one "matters and that management cares" about them.

## **4.2 Round 2 – Respondent Answers**

Upon distribution of the Round 1 responses to the panel, the unanimous response from the panel was that they (all panel members) agreed with all the comments of all the other members of the panel. The researchers explained to the panel that such a

conclusion meant that all eight of them were “on record,” so to speak, that every comment made by every panel member could be attributed to every panel member. All members agreed that this was accurate, so the researchers stopped the research at the second round.

## 5 CONCLUSIONS

This study specifically focused on what incentives were offered to the skilled crew leaders and foremen in the construction industry that retain, motivate and increase their productivity levels most effectively. The foremen and skilled crew leaders are not offered the same incentives, nor at the same frequency. Crew leaders were offered the fewest incentives, with the foremen being the second-least incentivized position. Although monetary incentives are not as effective to specifically retain an employee, many construction workers will leave for a higher paying job very quickly. Recognition is the single most important incentive, not only for increasing worker’s productivity, but also for motivation and retention of workers.

The Delphi method, which was used to conduct this research, proved to be a suitable process for obtaining data throughout this study. Questioning a pool of eight experts—all with a vast amount of knowledge regarding this issue, especially in regards to the field operations and what drives their workers to perform at the highest level—ensured the information collected was relevant, due to the fact that the minimum number of required respondents for the Delphi method needed to be at least six. This method enabled the experts to anonymously provide feedback regarding what each of the other respondents stated for all of the questions, which allowed them to avoid groupthink and look at every question from multiple perspectives and at a high level of detail. This also enabled each of the respondents a significant amount of time to think through each of the questions carefully and critique the other’s answers without being pressed for time, which would occur if this was done in a conference type setting.

The process went through two rounds, with all respondents agreeing with all responses given in the first round. As no changes were recommended in the second round, the process was ended by the researchers.

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