

# How to Improve Crew Motivation and Performance on Construction Sites

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## Introduction

Labor productivity and performance both significantly influence the overall success of construction projects, and the motivation of crew members is a major factor affecting labor. The construction industry, however, lacks adequate methods of measuring motivation and its impact on performance, which in turn enable industry practitioners to identify the most effective ways to improve labor motivation and performance. The motivation and performance of *individual* laborers certainly affects project performance, but because construction activities are most often carried out by crews, practitioners also need to be able to measure motivation and performance at the *crew level*. Furthermore, the project context and situation in which work is performed affect both individual and crew-level motivation.

24 **Goals**

25 The goals of this paper are to:

- 26 • identify the factors that most greatly affect crew motivation and performance;
- 27 • define the relationships between these factors and crew performance so organizations can
- 28 develop appropriate strategies to improve construction performance; and
- 29 • provide construction industry practitioners with effective recommendations they can use
- 30 and actions they can take to improve crew motivation and performance.

31 **Scope**

32 In this study, data were collected and analyzed within the context of industrial construction  
33 projects. While many of the motivation- and performance-improvement recommendations  
34 resulting from this research are generalizable, different or additional factors may be important in  
35 other contexts; for example, situational/contextual factors in the area of building construction may  
36 be different than those in industrial construction.

37 **Methodology**

38 This study identified individual- and crew-level motivational factors and project-level  
39 situational/contextual factors that affect crew motivation and performance. It also identified  
40 construction crew performance metrics in the areas of task performance, contextual performance,  
41 and counterproductive behavior. (See Raoufi and Fayek [2018a] for the full list of motivational  
42 and situational/contextual factors addressed in this study.)

43 Survey data were used to determine:

- 44 • the top factors influencing construction crew motivation and performance;
- 45 • the factors with the greatest potential for improving construction crew motivation and
- 46 performance; and

47 • the factors that, when evaluated in terms of relative importance, reveal differences in the  
48 perspectives between supervisors and craftspeople.

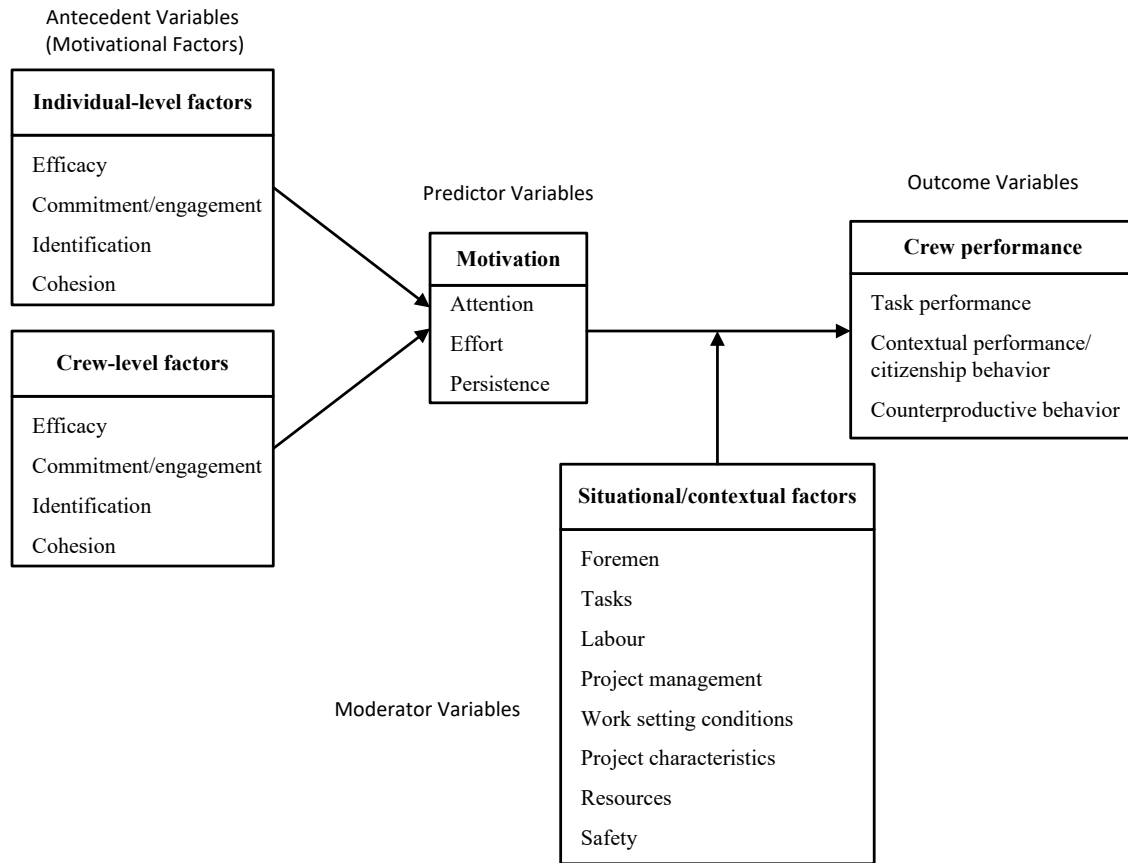
49 Field data were used to determine:

50 • the individual- and crew-level motivational factors that are most closely related to crew  
51 performance metrics and

52 • situational/contextual factors that have a direct as well as moderating effect on the relationship  
53 between crew motivation and performance.

#### 54 **Key Findings and Recommendations**

55 The factors used to measure motivation level of crews based on individual- and crew-level  
56 perspectives are: efficacy, such as self-confidence in one's ability to perform difficult tasks  
57 (Hannah et al. 2016); commitment/engagement, such as being very happy to spend the rest of one's  
58 career with the organization (Cesário and Chambel 2017); identification, such as taking pride in  
59 being part of the crew (Lin et al. 2016); and cohesion, such as getting along with other crew  
60 members (Chiniara and Bentein 2017). The factors used to characterize the project context or  
61 situation are factors related to: foreman, such as leadership; task, such as task type; labor, such as  
62 crew size; management, such as time management; work setting conditions, such as congestion;  
63 project characteristics, such as work shifts; resources, such as material availability; and safety,  
64 such as training. Crew performance metrics consist of: task performance, such as productivity;  
65 contextual performance, such as self-development; and counterproductive behaviors, such as  
66 misuse of time. The relationship between the factors used to measure the motivation level of crews  
67 at both the individual and crew levels, factors used to characterize the project context or situation,  
68 and crew performance metrics are shown in Figure 1.



69

70 **Fig. 1.** Relationship between motivational factors, situational/contextual factors, and crew  
 71 performance metrics.

72 ***Critical Factors Influencing Construction Crew Motivation and Performance***

73 The top critical factors influencing construction crew motivation and performance were  
 74 determined based on surveys of supervisory and craft personnel. *Critical factors* are those factors  
 75 that are both present on and very important to a project and therefore may significantly impact  
 76 crew motivation and performance.

77 The following are the top five critical factors identified by **supervisors**:

- 78 1. Protective safety gear is mandatory for performing the tasks.  
 79 2. The members of this crew can identify hazards and mitigate the risk associated with them.  
 80 3. The quality of equipment is suitable for performing the task.  
 81 4. Cooperation among the members of this crew is high.

82 5. Teamwork in this crew is good.

83 The top supervisor-identified critical factors can be managed through (1) precise project planning  
84 and monitoring and (2) by improving the experience and skills of foremen and craftspeople  
85 through training programs.

86 The following are the top five critical factors identified by **craftspeople**:

87 1. The members of this crew feel confident that they can successfully perform difficult tasks.

88 2. There is high mutual trust between the foreman and crew members.

89 3. The members of this crew believe in their ability to perform the tasks effectively.

90 4. The foreman has the required knowledge of the work.

91 5. The foreman has the required experience to define procedures for performing the tasks.

92 The top craft-identified critical factors can be addressed by (1) improving the skills and experience  
93 of foremen and project managers through training programs, (2) through training and interactive  
94 site meetings, such as tailgate meetings, that encourage safety behavior within crews, and (3) by  
95 increasing the self-efficacy and collective efficacy of individuals and the crew through training  
96 programs for craftspeople and by providing the opportunity for craftspeople to provide input to  
97 work tasks. In construction, *self-efficacy* refers to an individual worker's judgments about his or  
98 her ability to perform a specific task, whereas *collective efficacy* refers to the crew's shared  
99 judgment of its ability to perform a specific task.

#### 100 ***Factors with the Greatest Potential to Improve Construction Crew Motivation and Performance***

101 The best way to make improvements is to identify things that are important to but missing from  
102 a project. In other words, factors with the greatest potential to improve construction crew  
103 motivation and performance are those factors with a high level of importance to but a low presence  
104 on the project.

105 The following are the top five factors identified by **supervisors**:

- 106 1. The members of this crew have a high degree of freedom in selecting the procedures to be used  
107 in carrying out their tasks.
- 108 2. The working area is protected from wind effects (e.g., working area is a closed area).
- 109 3. The members of this crew have a high degree of freedom in scheduling their tasks.
- 110 4. The working area is protected from precipitation (e.g., working area is a covered area).
- 111 5. The working area is protected from overall weather effects.

112 The following are the top five factors identified by **craftspeople**:

- 113 1. The working area is protected from overall weather effects.
- 114 2. The working area is protected from precipitation (e.g., working area is a covered area).
- 115 3. The working area is protected from wind effects (e.g., working area is a closed area).
- 116 4. The members of this crew have a high degree of freedom in selecting the procedures to be used  
117 in carrying out their tasks.
- 118 5. The goals assigned by the foreman to the crew are difficult.

119 Based on the current study, the following are some things that both supervisors and craftspeople  
120 think are likely to improve productivity:

- 121 • Protect the work area from the effects of wind and precipitation by providing shelter for  
122 activities and increasing the number of activities done in covered spaces. For example, increase  
123 the amount of prefabrication work completed in workshops rather than onsite.
- 124 • Schedule field activities seasonally to take advantage of favorable weather conditions, which  
125 may also improve crew motivation and performance.
- 126 • Giving crew members more freedom in the selection of work procedures or task scheduling  
127 may increase their motivation and performance.

128 In addition, the fifth-ranked factor identified by craftspeople was the assignment of more difficult  
129 goals by the foreman to the crew, which when combined with support from the foreman, may  
130 provide an appropriate challenge for crew and lead to increased motivation and performance for  
131 them.

132 The usefulness of different strategies will depend on the exact situation of a given project, but  
133 being aware of some factors that typically help will give practitioners have a head start. In the  
134 construction context, knowing factors that contribute to significant improvements in crew  
135 motivation and performance can help project managers improve company policies and procedures.

### 136 *Differences in the Perspectives of Supervisors and Craftspeople*

137 Differences in perspectives may lead to misunderstandings. Being aware of possible stumbling  
138 blocks can help one avoid them and improve productivity. In the context of construction projects,  
139 this entails mitigating or eliminating sources of possible conflict between supervisors and  
140 craftspeople, which in turn leads to an improved understanding of the work environment and  
141 potentially improving crew performance. The following are “red flags,” that is, factors that indicate  
142 the greatest difference in perspective between supervisors and craftspeople and therefore serve as  
143 warnings:

- 144 1. Tasks are very complex in this project.
- 145 2. The members of this crew try to participate in decision-making process.
- 146 3. The foreman’s decision-making style related to work issues is participative rather than  
147 autonomous.
- 148 4. This company or labor union has a great deal of personal meaning for the members of this  
149 crew.
- 150 5. Crew members can participate in goal setting.

151 ***Correlation of Factors to Performance***

152 In some cases, if one factor moves in a certain direction, another factor usually moves in the  
153 same direction. Such factors are positively correlated. Factors for which the opposite is true are  
154 negatively correlated. For example, if crew motivation increases, then crew productivity increases.  
155 Crew motivation and productivity are positively correlated. If crew motivation increases, then  
156 counter-productive behavior decreases. Crew motivation and counterproductive behavior are  
157 negatively correlated.

158 The results of this study indicate that correlations with crew performance metrics for crew-  
159 level motivational factors are greater than those for individual-level motivational factors. This  
160 means that interactions between individuals in a group have a greater impact on crew motivation  
161 than the actions of any one individual. The results also indicate that almost all motivational factors  
162 (except for identification at the individual level) have a strong positive relationship with overall  
163 crew performance; in other words, as these motivational factors improve, so does crew  
164 performance.

165 ***Situational/Contextual Factors as Moderators***

166 Certain factors can run interference, or moderate, between how your crew is motivated and  
167 how it performs. In other words, they influence the relationship between crew motivation and  
168 performance. Situational/contextual factors can also have a direct effect on crew performance,  
169 depending on how strongly they are correlated with crew performance. This study highlights five  
170 things that can moderate between crew motivation and performance, those being factors bring  
171 those related to the foreman, task, labor, management, and work setting conditions. Project  
172 characteristics, resources, and safety are three categories of factors that directly affect performance  
173 but do not affect the relationship between crew motivation and performance (i.e., do not serve as



174 moderators). Improving factors in these three categories will therefore improve crew performance  
175 directly but have moderating effects. Improving factors in the other five categories – foreman, task,  
176 labor, management, and work setting conditions – will improve crew performance through both  
177 direct and moderating effects. Thus, if the goal is to increase crew performance, then all  
178 situational/contextual factors should be improved, those with both direct and moderating effects  
179 would be improved first. However, in reality, construction decision-makers never have their ideal  
180 amounts of time and money.

181 In order to improve both crew motivation and performance, improvement of  
182 situational/contextual factors that have both a direct effect on performance and a moderating effect  
183 on the relationship between crew motivation and performance should be given priority. For  
184 example, say one factor, visibility of outcome, has a moderate direct effect on crew performance  
185 but a strong moderating effect on the relationship between crew motivation and performance. A  
186 second factor, congestion in the work area, has a strong direct effect on crew performance but a  
187 moderate moderating effect on the relationship between crew motivation and performance.  
188 Ensuring you have a highly motivated crew does not do much good if congestion on the job site  
189 prevents them from achieving their goals. Thus, the combined direct and moderating effects of  
190 improving visibility of outcome for the crew and/or reducing working area congestion in  
191 combination with improving crew motivation would most significantly improve crew  
192 performance.

193 In short, understanding the relationship between factors affecting crew motivation and  
194 performance will help in the prioritizing the investment of resources to improve performance.

195 The greatest number of moderating situational/contextual factors is in the foreman category,  
196 reflecting the importance of factors related to how the foreman gets along with others, especially

197 those he or she is leading. It is therefore important to provide specific training for foremen to  
198 improve their knowledge and behavioral and functional skills. Furthermore, site meetings or  
199 activities that encourage positive interactions between the foreman and crew will improve their  
200 working relationship and build trust, which further increases crew motivation and performance.

201 Situational/contextual factors in the task category can be improved by designing and planning  
202 tasks in such a way that each working shift involves repetitive tasks rather than task changes and/or  
203 rework. The visibility of the project's outcome may be improved by providing feedback to crews  
204 regarding the project's achievements (e.g., safety performance), providing information to crews  
205 on the impact of the project (e.g., making life better for others, by providing health services, safety  
206 services or improved living conditions), and celebrating project milestones (e.g., completion of  
207 major project components).

208 In the labor category, the situational/contextual factor *crew size* has a moderating effect;  
209 therefore, using an optimum crew size (neither too many nor too few) for each task can improve  
210 the relationship between crew motivation and performance. Since large crew size has a negative  
211 direct effect on crew performance, using smaller crew sizes may help improve performance,  
212 provided the minimum crew size for effectively carrying out the task is met. Consider breaking  
213 down larger activities into smaller tasks that can be performed by smaller crews.

214 Project time management and project cost management are moderating situational/contextual  
215 factors in the management category. Excessive mid-project changes in schedule or budget can  
216 certainly affect construction crew motivation and performance. It is therefore important to  
217 carefully monitor project schedule and costs so you can take timely corrective action and  
218 effectively manage deviations from planned values.

219 Two factors of work setting conditions, *location of facilities* and *site congestion*, have a  
220 moderating effect on the relationship between crew motivation and performance. It is therefore  
221 important to locate facilities (e.g., washrooms and lunchrooms) where they are easily accessible  
222 by crews and involve minimal travel time to and from the workspace. Congestion in working areas  
223 should be reduced by removing unnecessary objects, materials, or equipment from task locations  
224 and minimizing trade stacking.

225 A summary of recommendations to improve crew motivation and performance on construction  
226 sites, based on the key findings and recommendations in this study, are provided in Table 1.

### 227 **Limitations**

228 This study was limited to motivational factors that operate at the individual and crew levels of  
229 construction crew function. Some other motivational factors operate only at the individual level,  
230 such as pay rates. Future research can examine these individual-level motivational factors in  
231 addition to the ones presented in this study. The results of the field data analysis, particularly with  
232 respect to situational/contextual factors that affect crew motivation and performance, are specific  
233 to industrial construction projects; data collection and analysis from different construction sectors  
234 would help identify how similarly or differently these factors affect crew motivation and  
235 performances in those sectors. The relatively small sample size of craftspeople who responded to  
236 the surveys means further data collection and analysis should be performed in order to generalize  
237 the results with respect to craftspeople. The findings of this study also reveal the need for additional  
238 research focused on improving foreman behavioral skills, which were shown to significantly  
239 influence crew motivation and performance.

Table 1. Recommendations to improve crew motivation and performance on construction sites.

Recommendation <sup>a</sup>	Example action(s) <sup>b</sup>
Improve functional skills of foremen and craftspeople	<ul style="list-style-type: none"> <li>• Provide training programs</li> </ul>
Improve behavioral skills of foreman	<ul style="list-style-type: none"> <li>• Give more freedom to crew members in the selection of work procedures or task scheduling</li> <li>• Provide an appropriate challenge for the crew by assignment of more difficult goals to the crew when combined with support</li> </ul>
Encourage safety behavior within crews	<ul style="list-style-type: none"> <li>• Provide training and interactive site meetings</li> <li>• Provide the opportunity for craftspeople to provide input to work tasks</li> </ul>
Mitigate/eliminate sources of conflict between supervisors and craftspeople	<ul style="list-style-type: none"> <li>• Improve understanding of the sources of difference between opinions of supervisors and craftspeople</li> </ul>
Improve the working relationship and build trust	<ul style="list-style-type: none"> <li>• Perform site meetings or activities that encourage positive behavior and interactions</li> </ul>
Increase visibility of the project's outcomes	<ul style="list-style-type: none"> <li>• Provide feedback to crews regarding the project's achievements</li> <li>• Provide information to crews on the impact of the project in providing services to the public</li> <li>• Celebrate project milestones</li> </ul>
Improve designing and planning tasks	<ul style="list-style-type: none"> <li>• Design each working shift to involve repetitive tasks rather than task changes frequently</li> </ul>
Use optimum crew size for each task	<ul style="list-style-type: none"> <li>• Break down larger activities into smaller tasks to allow smaller crew sizes</li> <li>• Provide the minimum crew size for effectively carrying out each task</li> </ul>
Mitigate the risk of excessive changes in project schedule or budget during project execution	<ul style="list-style-type: none"> <li>• Carefully plan and monitor the project schedule and costs</li> <li>• Effectively manage deviations from planned values by taking timely corrective actions</li> </ul>
Improve work-setting conditions	<ul style="list-style-type: none"> <li>• Protect the working area from the effects of wind and precipitation</li> <li>• Increase the number of activities done in covered spaces (e.g., increasing prefabrication in workshops)</li> <li>• Locate facilities (e.g., washrooms and lunchrooms) to be easily accessible by crews</li> <li>• Reduce congestion in working areas by removing unnecessary objects, materials, or equipment from task locations</li> <li>• Reduce congestion in working areas by minimizing trade stacking</li> </ul>
Take advantage of favorable weather conditions	<ul style="list-style-type: none"> <li>• Schedule field activities seasonally</li> </ul>

241 <sup>a, b</sup> Recommendations and example actions are specific to the context of industrial construction projects

## 243 **Future Steps**

244 Next steps for this study include developing methods for modeling the relationship between  
245 motivational factors, crew motivation, and crew performance (Raoufi and Fayek 2018b). Such  
246 models will facilitate the simulation of scenarios with different combinations of motivational  
247 factors and situational/contextual factors that affect construction crew performance, allowing  
248 researchers and practitioners to explore which combinations lead to the best performance and to  
249 observe the sensitivity of performance to changes in these factors.

## 250 **Data Availability**

251 All data, models, and code generated or used during the study appear in the submitted article.

## 252 **Acknowledgements**

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