

# **Analysis of Student Understanding of the Change Order Process**

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Effective project management comes from controlling cost, time, and quality on a project. As construction projects become more complex, changes in the original contract documents will arise due to the nature of human error. How a project manager documents and addresses change events can alter the successfulness of a project. This study attempts to look at senior level construction management major student's understanding of the change order management process. The goal of the study is to ascertain how well the students feel the construction management curriculum prepared them to manage change events in industry. Students were asked to demonstrate their understanding of key aspects to the change order process – requests for information, potential change orders, change order requests, time & material pricing, negotiations and impacts to the schedule. Results indicated that students would like to see the introduction of modules into existing lab curricula to gain a better understanding of change order processes.

**Key Words:** Cal Poly, Change order, Construction, Curriculum, Cost

## **Introduction**

With the rise of architects and engineers controlling the design process for construction projects, they produce plans and specs that provide a standard of care in respect to the design of the building. This standard of care is by no means a defect free representation of the work that the contractor will build. A good design will require minimal differences to the original document in order to complete the project. However, defects will arise during the construction process – especially as the integration of more complex systems becomes common place. A construction manager is then tasked with the coordination of changes in the original contract in order to acquire compensation for the changes. This task includes understanding the process from writing the original request for information of a design defect all the way through pricing up the changes and assessing time impacts as a result of the changes.

Change order management is an important skill set that students in the construction management department will encounter throughout their studies. Classes in the curriculum attempt to provide a “Learn by Doing” atmosphere by having students address how they would deal with change orders on a project. This study’s intent is to analyze the students’ understanding of the change order process with the purpose of providing feedback to professors on where more change order management topics could be addressed and implemented.

## **Literature Review**

Change order management includes identifying the problem, sending out requests for information, establishing potential change orders, pricing extra work tags and packaging all the information into a final change order. “Claims have become the norm rather the exception in construction projects. As such, successful projects are not those which attain minimal number of claims, but rather those with the best handling of claims.” (El-Adaway, 2017) Understanding the process behind change order management will provide the ability to make better decisions in a leadership role on the construction team. Successful projects often times will be on time and on budget, yet claims can derail these objectives. “How you document and handle claims is a key to project smoothness, rather than the claim-causing events themselves.” (El-Adaway, 2017)

“Unless it specifically allows the owner to make changes, all construction contracts are changeless contracts.” (McGreevey, 2009) However, in today’s society the construction contracts normally involve a changes clause which allow the owner to make change order requests within the scope of work. In order to carry on with a project smoothly, a contractor should take measures to leverage the best possible outcome during a change event. “Demand a written order to do the change.” (McGreevey, 2009) Documentation of the change will result in having evidence in the case of negotiations and legal battles over the cost and time impacts of a change order. Along with documentation of the process it is imperative to communicate a change event with the project team – including any subcontractors. “Just because the change is to reroute ductwork doesn't mean that an electrician, plumber, fire sprinkler or other subcontractor won't also be affected.” (McGreevey, 2009)

Documentation and communication of change events will affect the successfulness of a change order during its initial stages but careful consideration should be addressed during the pricing of change orders. When the contractor is preparing a cost proposal for the changed work, it is important to include all the costs, overhead, and profit. “In addition to the actual cost of performing the changed work, the contractor should include as well the cost effects on other activities under the contract.” (Serag 2010)

“Furthermore, more cost and time savings, and quality improvement could be achieved by the group practicing change management, and when compared to the outcomes of the other group, the difference was statistically significant.” (Hwang 2012) Change order management can be linked to the successfulness of a construction project.

Students understanding of the methods by which the industry manages the change orders can give them a head start on a career that will inevitably run into change.

## **Methodology**

Data for this senior project was based around exploratory research through a student survey. Senior level students were administered the survey during class. The development of the survey began as a dialogue between faculty and students on the best way to evaluate student understanding of the change order management process.

Students who took the survey were apart of either the CM 413 jobsite management class or CM 415 integrated project delivery class. These classes were chosen due to the perquisite requirements that make the majority of the students senior level standing. Along with senior level standing, the target population were students that have taken CM 413 jobsite management through the change order exercise and CM 334 construction law which addresses contract change processes. The length of the survey was ten questions with four being multiple choice and six being free response.

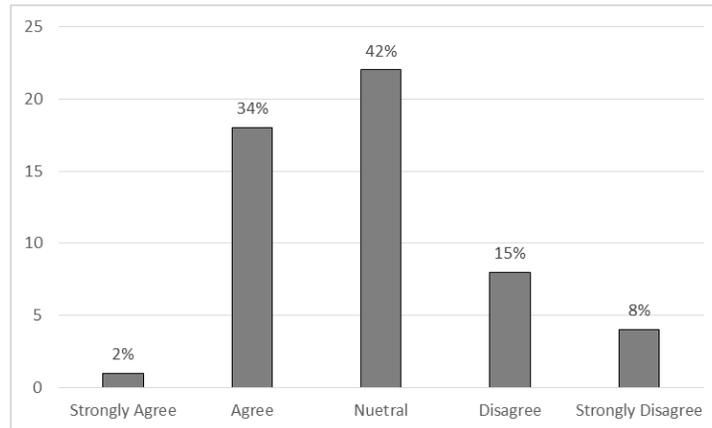
This survey was broken down into different sections in order to analyze the students' understanding. Questions one through three ask the respondent about background information that they have that relates to change order management. The survey then transitions into key a free response section for the respondents to complete for analysis of understanding. Lastly, question 10 offers the respondents a chance to provide feedback. These questions encompass the entirety of the senior project on whether or not the current senior students feel prepared to manage change orders post-graduation and feedback on ways to improve the current curriculum.

The free response section included six questions in order to analyze student understanding of key terms in the change order management process. Respondents were asked to write a one to two sentence response for each of the six terms. The following was the basis of understanding for the analysis of student responses.

- 4) Request for information – contractor submits request for clarification to owner/architect
- 5) Potential change order – contractor proposes rough order magnitude of the change and/ or notifies the client or GC or both of the potential for the change even if there is not a price yet affixed and establishes a timeline for change orders and pricing.
- 6) Change order request – owner requests the contractor to proceed with the change
- 7) Time & material price – contractor provides time & material cost of the change after completion
- 8) Negotiations – owner and contractor agree on final compensation after discussions and possible value engineering amongst other considerations.
- 9) Change order impact (time) – contractor addresses schedule impacts as a result of the change

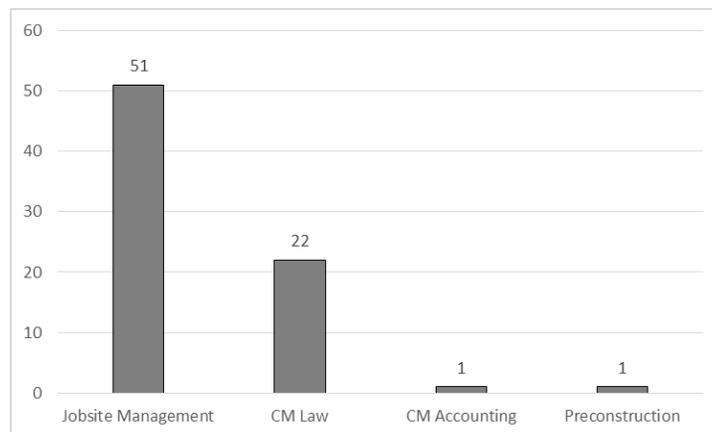
## Survey Analysis

Figure 1 addresses how well the students feel prepared to manage change orders in the field. The results show a mix of preparedness through the respondents. A majority of the students, 65%, answered neutral through strongly disagree which suggests that students could use more preparation to feel equipped to manage change orders.



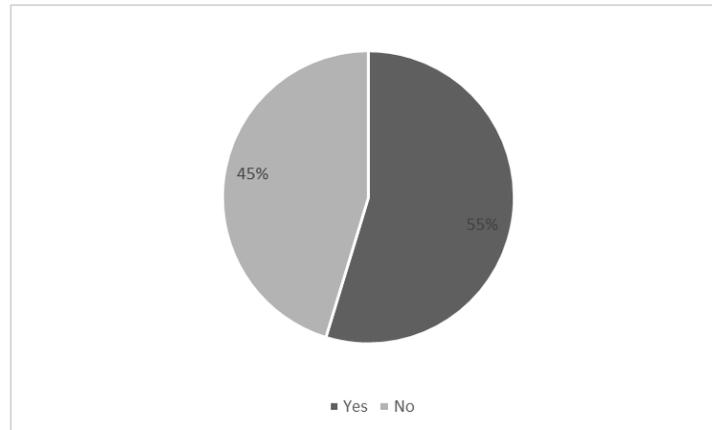
*Figure 1:* Response to Question #1: Do you feel prepared to manage change orders?

Question #2 addresses which classes the students felt pertained to change order management that they have taken or are currently taking. The results demonstrate a surprising trend of students not relating CM law to change order management. “Yet course learning objective five for the class according to the syllabus states students should be able to summarize contractual change processes.” (Starzyk 2018)



*Figure 2:* Response to Question #2: What classes have you taken or are currently taking that apply to change order management?

Construction management students often complete summer internships in relation to their field. Question #3 takes a look into whether or not students have encountered change orders outside of the curriculum. There was an even response from students on their experience with change orders during their internships.



*Figure 3: Response to Question #3: Have you dealt with change orders during an internship?*

Respondents were asked about their understanding of a request for information in question #4. Most students understand that the request for information is a document that a subcontractor or contractor submits for clarification of the contract documents. There was a significant group of respondents who didn't address who receives the document and issues the clarification.

Potential change orders start off the change order process by allowing the contractor to request a change to the original contract and address rough order magnitude of cost and time impacts associated with the change. In question #5, respondents clearly addressed the aspect that potential change orders usually come after requests for information and are addressed to the owner of the project. However, very few elaborated that this point in the change order process allows the contractor to give their opinion on the cost and time impacts that would be a result of the proposed change.

Question #6 addresses the change order request issued from the owner to the general contractor. Many respondents couldn't distinguish the difference between a potential change order and the change order request. Responses generally thought of the change order request as a document that the general contractor submits to the owner/architect for approval of a change order. It's important to recognize the slight differences in the change order request as opposed to a potential change order because documentation of a change event is vital to agreeing on the terms in which the scope change will be compensated.

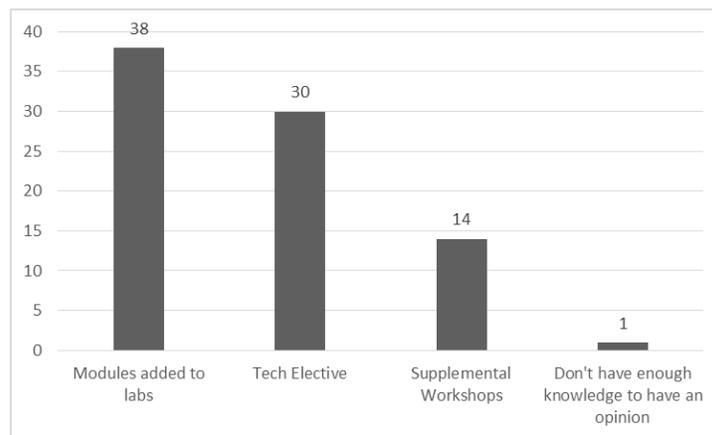
Time and material pricing is a common way for contractors to track the actual costs that occur as a result of a change event. In question #7 respondents viewed time and material pricing as an estimate of the work to be performed. Another common response from the surveys was that time and material pricing comes as a result of cost escalation

for materials on the jobsite. Students didn't understand this pricing method and got it confused with the potential change order phase of a change event.

Question #8 speaks to negotiations that occur between an owner and a general contractor to iron out the pricing and time impacts of a change event. A majority of students understood that the two parties use negotiations to meet in the middle. Some students responded that negotiations aren't applicable in a change order scenario while others viewed the negotiation parties as the general contractor and subcontractor.

Change order impacts in respect to the schedule were addressed in question #9. Respondents understood that a change event needs to look at the potential time delays that could result from a change event. A majority also put that there are times where the impact can accelerate the schedule instead of causing delays – possibly in the case of a value engineering scenario.

Lastly, Figure 4 gives the respondents an opportunity to state ways in which the respondent would like to incorporate change order topics into the curriculum. The majority of responses preferred additional modules added into the current labs that are taken during the course of their degree or the addition of a tech elective focusing on change order management.



*Figure 4:* Response to Question #4: How would you like to incorporate more change order management topics into the curriculum?

## Conclusion

This study looks at the current senior perspective on how prepared they feel to manage change orders. Successful management of change orders include requests for information, potential change orders, change order requests, time & material pricing, negotiations, and impacts to the schedule. Contractors shouldn't try to cause changes throughout their projects on every variance but should have a working knowledge on how to adapt to the changes that arise.

Students' understanding of the change order process could be the result of their prior internship experiences. However, the curriculum can provide guidance on how to address change orders prior to experiencing them in a real life scenario. The overall consensus suggests that there are ways to incorporate more change order topics into the construction management curriculum. Modules can be added into the labs to simulate change order management skills in each of the main industry sectors – residential, commercial, heavy civil, and specialty construction.

## **Future Research**

Many students responded that CM Law didn't relate to the change order management process in their opinion. Future research could use that data and figure 4's response that students would like to see modules incorporated into current classes to fulfill change order management training. The module could build off the current debate style classroom to give students the opportunity to negotiate over change order claims from various projects. This would encompass Cal Poly's ideal of "Learn by Doing."

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