

CHANGE ORDERS

A Curse or Blessing?

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Do change orders help or hurt your job productivity and profitability?

The perception of most project managers is that they can make good money on change orders (COs) due to higher profit margins that can be charged for changes in project scope. In reality this is a dangerous and often a one-dimensional and misleading perspective. Research and studies conducted by MCA, NECA, universities, and other associations indicate that contractors more often end up with less money than expected despite higher priced labor using NECA 1, NECA 2, or sometimes even NECA 3 for their labor units. How come we add more revenue for new scope, and still lose profit?

The graph to the right shows a case study analysis from an Agile Construction® practitioner that was interested in what the impact of project change orders (X-axis) is on labor productivity (Y-axis). The results from the full investigation for the contractor confirmed the same pattern as illustrated in the graph to the right.

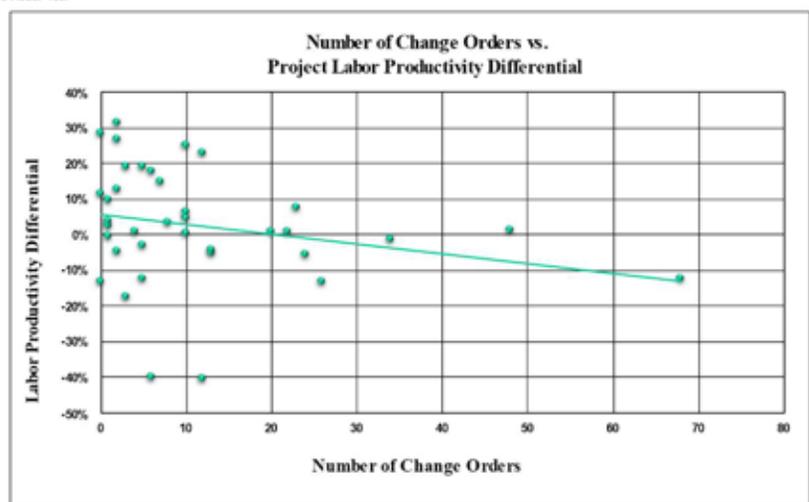
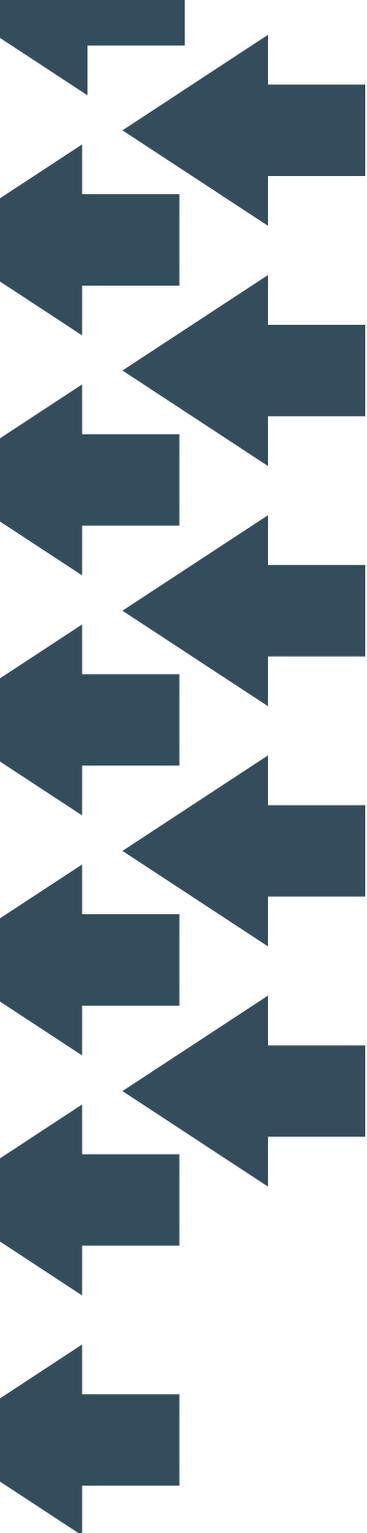


FIGURE 1: The higher the number and size of change orders on a job, the more likely is it that the job will finish with lower than expected labor productivity, hence, lower than expected profit.



What is the problem with change orders?

What is driving these unexpected results? Why are COs obviously detrimental to project performance rather than beneficial? The underlying cause and answer to this question lies in the type and additional risk a change order carries that gets added to the project. The true cost of COs goes beyond the pure cost of a change order, such as cost for material, labor, and additional overhead. It includes the additional operational risk and associated cost for the project, which are often overlooked – not intentionally but they often get missed because they are either invisible or unknown to project managers, estimators, and executives. Even an additional markup does not compensate for the full cost and impact of COs for the large majority of projects.

Timing of COs is also important. Most COs typically occur in the middle of the job, which makes it more likely that some of the related risks do not get captured before the CO takes place. Unidentified risk can't be managed, which consequently has adverse effects on labor productivity and ultimately cause deviations from expected project profitability, based on MCA's Research (2019). Studies show that the reasons why COs erode project profits can be grouped into three main reason categories:

1. Disruption of the original project schedule and flow of work
2. Delay in recognition or reporting of changes
3. Use of CO profits to cover labor overage or productivity losses on the original scope of work

Underlying and related to each of these three categories are three different types of risk that every construction project shares. The composition of Technical Risk, Business Risk, and Integration Risk will vary across projects as well as change orders depending on the scope and activities involved to complete the project or requested change. These risks need to be identified, evaluated, and actively managed for each project change.

X TECHNICAL RISK: The probability of a physical failure of the built environment to function accordingly to the customer or structural requirements

- Labor skill for technical work, material availability, material/component quality
 - What and who are the sources of information?
 - Do we have the most recent and up-to-date set of drawings and specs available?
 - When are you allowed to work on a change order?

X INTEGRATION RISK: The probability of failure at the interface of resources required to complete the project, including workforce power, material, money, and information.

- Schedule, trade stacking/coordination, shift work/premium time, availability of tools, equipment, and information, lead/order time, jobsite logistics
 - What and who are the sources of information?
 - Handoff Process
 - Was the base bid correct?
 - Is information missing? Prebid, Request For Information's, Value Engineering, alternates
 - What's changing?
 - In the field – are there schedule changes per phase?
 - Is it tracked on the Change Log?

X BUSINESS RISK: The probability of a difference between the expected and actual financial outcome of a project

- Local requirement and regulations, payment terms, penalties, customer relationships, cost escalation
 - What and who are the sources of information?
 - Does the General Foreman need to know the business scope?
 - Bid-day negotiations/adjustments made that are very often not communicated to the field

How can we turn this around and use change orders to our advantage?

The key is to reduce and ideally mitigate the additional risk associated with the change request. This can be done by ensuring a concentrated effort to clarify and confirm any possible questions regarding the change as early as possible. This can be done by:

1. Ensure the whole project team recognizes the change order timely
2. Identify and escalate any schedule impacts timely
3. Make sure that the actual work can get performed with high productivity

To be able to accomplish these three items, specific tools can be used to increase the visibility of the change orders. Through the use of Agile Construction® Tools; that use the Standard for Job Productivity Measurement in Construction, ASTM-E2691; like Job Productivity Assurance and Control (JPAC®) and Short Interval Scheduling (SIS®), the impact of change orders can be identified actively (through SIS®) and indirectly (through JPAC®). The changes will become tangible and visible through a loss of labor productivity in the week the change order starts to impact the job site. Using the Agile Construction® Tools will help to recognize and identify possible changes or change order work on-site. The project team can use the signals and data to follow-up and to make ensure everything gets captured and clarified timely. The project team does not have to rely on the risk of one single person to recognize and think about addressing the change order. Recognition, identification, and escalation are very important but equally important is to make sure that the actual work can be performed with high productivity. A mistake that is commonly made is to consider the higher labor rates or additional mark ups on change order as 'extra money' and a 'safety cushion' for the job and its profitability. More often than not, this creates a perception of safety, reducing the incentive to stay productive or even better get more productive.

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How to make it happen? A Change Order Checklist and guidelines turn out to be most helpful. The best way to start creating such a checklist is to hold a Kaizen event with your most experienced field leads and project managers. The checklist should be frequently reviewed, discussed, and adjusted to assure that it stays up-to-date, and the items will be addressed. Below is an example checklist:

- How do you recognize a change?
- When does the GC or the customer need to be notified about the changes?
- Does the entire project team know and understand the scope, effort, risks and limitations involved with the change order?
- How will the change order be performed? Create a separate Work Breakdown Structure (WBS) for the change order and use the WBS to manage the 3Ms (Manpower, Material, Money) most effectively and efficiently
- Did Bid-day negotiations make up for additional overhead and operational effort?
- How do we make sure we are getting paid timely and correctly
- Do you know the overall flow of the change orders throughout the project?
- Do we know how to distinguish and apply Approved, Pending and Not Approved COs

Recognizing the technical, business, and integration risk for each change order is key. The three steps mentioned above will help to reduce the risk of change orders: the whole project team

recognizes the change order, escalates schedule impacts and quickly works for higher productivity on all aspects of the job. This together with the usage of the Agile Construction® tools like JPAC® and SIS®, that use the Standard for Job Productivity Measurement in Construction, ASTM-E2691, will allow every project team to make the change orders visible before they greatly impact the job. This allows the project team to react properly to earn the expected profit and the money to be made from change orders.

Dr. Heather Moore is vice president of operations for MCA Inc. and has taught numerous classes for the construction industry and has contributed to several research projects for ELECTRI, MCAA, NHF and NAW. She holds a Ph.D. in Construction Management from Michigan State University. Additionally she holds an MBA and a B.S.E. in Industrial and Operations Engineering, University of Michigan. She specializes in process design and operations research. Dr. Heather was a contributor to the ASTM Standard E2691, and she currently holds the position of vice chair of ASTM Subcommittee E06.81 on Building Economics. She has also co-authored four books on the Industrialization of Construction® and the future of the industry, and co-authored the industry's own "Prefabrication Handbook." Dr. Heather has experience working with the construction industry, and currently works with contractors and distributors across the country on process improvement and productivity measurement. ⚡