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MANAGING THE TRUE COST OF *Change Orders*

Change orders that are not proactively and properly managed account for unanticipated productivity and job profitability losses. This article explains how detecting and avoiding the side effects of change orders can help prevent these losses. It also explores why construction financial professionals (CFPs) must recognize that change orders, once official, only cover the portion that the customer has initiated.

Other hidden changes such as schedule changes, movement to other locations, and "favors" initiated by GCs produce extra work performed by the labor that is an invisible aspect of cost and labor overruns.

How to Prevent Derailing From the Original Schedule

In order to make the resource usage visible and prevent cost and labor overruns, the three elements of labor performance must be separated as follows:

1) *Work* is what needs to be done to complete the project;
2) *Effort* is the hours needed by the specific individual(s) who will perform the work; and
3) *Time* is the duration over which the effort must be exhorted for the work to be completed.

Without a clear picture of *work*, *effort*, and *time*, other labor and material usage will be unpredictable, which in turn means that the project's profitability will be unprojectable and unknown.

The project team in the field is doing far more work than what is being priced because the complete set of changes that the installers are addressing are not visible to the GC and owner. You should use the original project schedule as a yardstick to measure the impact of change orders and prevent it from derailing.

If the change order shows an impact on the original project schedule, then it should be noted and considered when

pricing the change order. The new schedule should be based on the project's original schedule, which matches the work that your team is contracted to complete.

Making Change Orders Visible & Trackable

A written work breakdown structure (WBS) translates the *tacit knowledge and experience* of field leadership into *explicit knowledge,* which then becomes the baseline used by field labor to recognize changes. To effectively maintain the project's original schedule, contractors must immediately detect and react to changes when they occur — not after the costs are incurred and recognized in financial reports.

While the financial reporting eventually shows how much is lost to unrecognized changes, it is often too late for the project team to recover lost profits due to unplanned and unmanaged expenses. The WBS implements proven management methods and tools.

The quickest access to change order visibility occurs when labor is able to recognize changes prior to performing work. Second to that is the ability to detect reduced productivity on the work planned in the original WBS.

With efficient and streamlined original project plans, the field labor will not perform unplanned tasks because they will simultaneously affect the base work's measurable productivity. If your productivity measurement tools are not detecting these changes, then they are not implemented within an effective process of project management. This could only mean that the tracking method is either not *used* by the field personnel or is not *useful* for them, which means it is more of an accounting tool than a field and project management tool.

Any project tracking and measurement tool based on American Society for Testing & Materials (ASTM) Standard E2691[1] will enable your team to quickly detect productivity changes resulting from unplanned work that occurs on the job, whether the changes were recognized and reported by the labor or not.

To effectively detect and mitigate any unresolved profitability losses, a process to measure productivity against the original budgeted hours in addition to all of the work associated with all base scope changes must be developed and implemented. Regardless of whether the changes are approved, they must be tracked to calculate the labor's effectiveness and efficiency against the baseline scope of work.

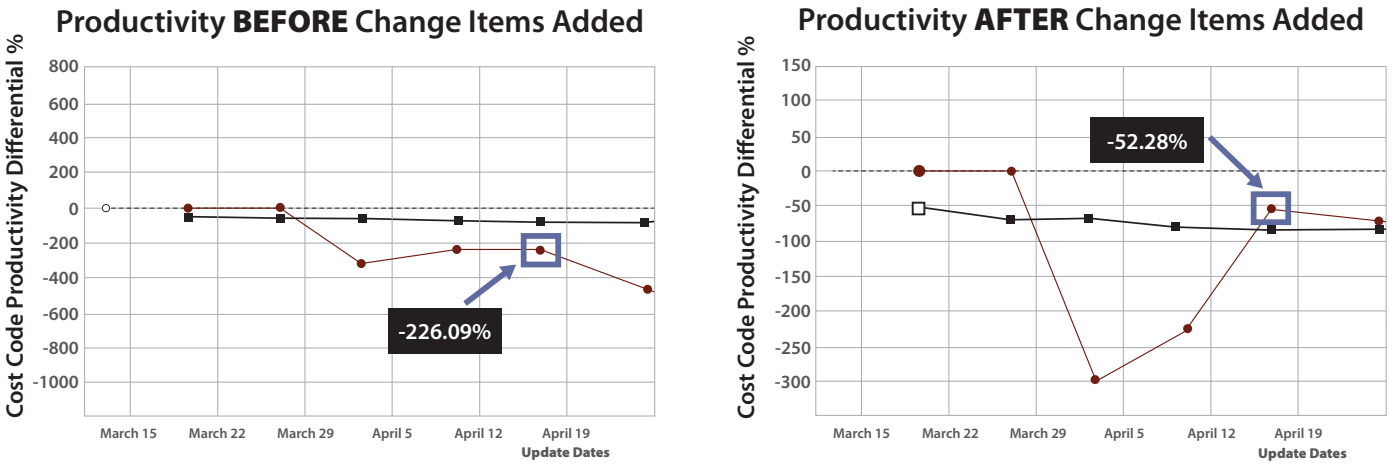
Exhibit 1 shows that the productivity impact of the change can be seen as soon as the change to the work is reflected in the tracking tool. Therefore, the earlier it is recognized and entered, the earlier you will be able to see and quantify the impact of the change. This will also give your team more time to attempt correction and recovery.

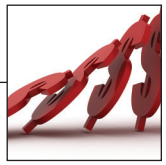
Managing Extra Capital in the Change Order

In order to realize increased profitability from change orders, the change in planned profit must first be recognized. Then, without diminishing the profits of the current work, the associated change order's work and money must be managed. This cannot be accomplished without visibility into a job's performance.

The project is most vulnerable to a change order's negative impacts when it is granted through a notice to proceed

Exhibit 1: Impact of Changes in JPAC®





(whether verbal or written), a contract value revision, or when additional labor or materials are added to the project plan and WBS.

If you only pay attention to the money and labor involved and not to what is happening operationally, then the change order money is frequently used as a way to cover any shortfalls that already exist on the job, such as previous bidding and selling negotiations and/or variations from expected productivity.

To incorporate the added profitability of more expensive change orders in the end results, due to higher labor or material cost, the added profit to the change order must be removed from the revised cost. For instance, if the original job was bid with $70 an hour for the labor cost and the change order is bid at $75 an hour, the added $5 should come off the job's profitability calculation and be added to the company's profit.

Once that number is known, it's important to obtain the details from the team that sees it as their own means to recoup prior failures and losses. Ensuring all of this works accurately and effectively is more complex than adding a larger revenue number than the associated incremental cost. To keep the job profit from being consumed in the base contract scope as general performance, it must be rewritten to reflect what portion is profit.

In the case study in Exhibit 2, notice that original bid labor is $87.50 per hour (composite rate) and that all change order labor is sold at $112 per hour. Even though this creates an additional contract value, in order to reflect this accurately, you must ask how much is expected to be categorized as labor cost vs. additional profit.

The additional labor rate will dilute the productivity expectation of the entire revised contract work as long as the costs entered match the estimate. The impact on the entire project's

Exhibit 2: Impact of Change Orders on Labor Rate & Profits

	Typical				Correct			
	Original	Revised	Actual	Projected	Original	Revised	Actual	Projected
Correct Value								
Contract	$2,890,000	$3,124,000	$3,124,000	$4,251,000	$2,890,000	$3,124,000	$3,124,000	$4,251,000
Pending Changes				$ 750,000				$ 750,000
Approved Changes		$ 234,000				$ 234,000		
NTP Changes				$ 377,000				$ 377,000
Billable Work		$3,501,000	$3,501,000	$4,251,000		$3,501,000	$3,501,000	$4,251,000
Expenses								
Labor (Dollars)	$1,098,125	$1,187,039		$1,615,270	$1,098,125	$1,167,594		$1,502,172
Labor (Hours)	12,550	13,344		17,167	12,550	13,344		17,168
Composite Rate	$ 87.50	$ 88.96		$ 94.09	$ 87.50	$ 87.50		$ 87.50
Tools/Equipment	$ 8,236	$ 8,903		$ 12,115	$ 8,236	$ 8,757		$ 11,266
Material	$ 636,913	$ 688,483		$ 936,856	$ 636,913	$ 677,204		$ 871,260
BIM/Design/Engineering	$ 57,322	$ 61,963		$ 84,317	$ 57,322	$ 60,948		$ 78,413
Subcontracts	$ 45,576	$ 45,576		$ 45,576	$ 45,576	$ 45,576		$ 45,576
Other Direct	$ 6,040	$ 6,529		$ 8,884	$ 6,040	$ 6,422		$ 8,262
Project Costs	$1,852,211	$1,998,492		$2,703,018	$1,852,211	$1,966,501		$2,516,949
Indirect/Allocated G&A	$ 362,381	$ 391,723		$ 533,039	$ 362,381	$ 385,306		$ 495,717
Profit	$ 675,408	$ 733,785		$1,014,943	$ 675,408	$ 772,193		$1,238,334
	23.4%	23.5%		**23.9%**	23.4%	24.7%		**29.1%**

composite labor rate displays this. With the overall composite labor rate only increasing to $94.09, the revised profit expectation comparably shifts from 23.4% to 23.9%. However, the profit expectation will increase from 23.4% to 29.1% if the added cost is considered profit and labor and if it is consistently added at an hourly wage of $87.50 (the same number of hours used in the change order estimate).

Keep in mind that, for the most part, how the labor rate is bid has no bearing on what the worker is actually paid. For this reason, a higher labor bid rate should have little or no impact on the actual composite rate calculated from payroll expense.

As an example, material purchased for a change order is sold at a higher mark-up. If the material associated with that particular change order is not removed from the revised material cost and added to revised profit in the same way, then a similar profitability erosion will occur. In jobs with significant post-bid material pricing negotiations and/or large jobs with special pricing for early purchase orders, this profit loss can become considerable on even a small change order.

Exhibit 3 shows the same case study as Exhibit 2 but includes highlights of the material impacts. In Exhibit 3, both material and labor profit recognition contribute significantly to the $223,391 of higher profit, and roughly 29% of that gain, or $65,597, comes from proper recognition of the increased material mark-up as profit.

Although the labor increase is significantly higher than the material contribution and failure to properly recognize the increased material mark-up is far less likely to occur, both contribute heavily to the correctness of profit recognition and the accurate management of manpower, material, and money by the project team.

Schedule impacts must be known prior to pricing the change order so they can be included ***before*** sending it on to the customer. The cost must be associated with the pending change order when the change order is first detected or when work that is beyond the original contract scope starts to impact the schedule or timing of the planned tasks. Additionally, once the change order has been approved, if it results in additional impacts to the original schedule, then these pending base contract impacts must also be priced as a part of the pending change order. Not recognizing and anticipating the base impacts is the most common reason why contractors fail to make money on change orders.

Consider the following example: a change is introduced to add additional power outlets and lighting in a large lobby for a new hotel. The physical dimensions of the lobby are not changed, and the GC assumes that the final completion date for all work remains unchanged. The GC simply expects more outlets and more lighting circuits in the space.

Is this practical or even achievable? What other trades are in that space working at the same time? How many workers? What other trades will now also have added work to coordinate these same changes (electrical, drywall, painting, flooring (if more floor boxes are added), ceiling, and potentially structural)? Will the work require additional manpower in the same schedule, or will everyone just spend more time in the same space (i.e., overtime)? Will additional supervision be needed? Will new purchase orders need to be placed with vendors for added material? Are there lead times involved? Will there be additional expedited shipping from vendors, rush orders through prefabrication, and added deliveries to be received on the jobsite?

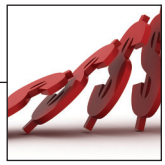
If all that is done is the pricing for the labor and material — even if the mark-up to profit is moved correctly — there is still a risk of losing a lot of money on this small change. The only way to make this visible is with a true project schedule based on the WBS and modeled with correct lead times and task interconnectivity. This impact cannot be estimated using a Gantt chart created using a spreadsheet or mapping tool.

While guessing may work on occasion, it is not a reliable process for estimating change orders or ensuring their profitability. CFPs must use the information available from the WBS, the productivity measurement, and a proper project schedule model to effectively know and estimate these impacts.

Conclusion

Change orders are an inevitable part of the project life cycle, and their impacts are not always visible to all interested parties. Change orders can take many different forms, and the key to making them work for the project's benefit include:

- Recognizing the type of change that is occurring, such as customer requests, schedule changes, local changes for other trades, and access to the areas as planned.
- Tracking all aspects of the changes, including money, material, labor, time, and impact on the original project.



- Adjusting the original project to allow adaptation to the impact of the change order.
- Invoicing accordingly without diluting the original project billing and profit recognition.
- Controlling the impact on labor dilution and the usage of the higher cost of labor as profit and not for covering the existing labor overruns as well as productivity losses and schedule and opportunity losses associated with the redirected resource. ■

Endnote

1. Daneshgari, Dr. Perry & Moore, Heather. "New Productivity Measurement Standard Affects Revenue Recognition." *CFMA Building Profits*. March/April 2012. *www.cfmabponline.net/cfmabp/20120304?pg=26*.

Exhibit 3: Sample Highlighting the Impact of Increased Material Mark-Up on Recognized Project Profit

	Typical				Correct			
	Original	Revised	Actual	Projected	Original	Revised	Actual	Projected
Correct Value								
Contract	$2,890,000	$3,124,000	$3,124,000	$4,251,000	$2,890,000	$3,124,000	$3,124,000	$4,251,000
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Labor (Hours)	12,550	13,344		17,167	12,550	13,344		17,168
Composite Rate	$ 88	$ 89		$ 94	$ 88	$ 87		$ 87
Tools/Equipment	$ 8,236	$ 8,903		$ 12,115	$ 8,236	$ 8,757		$ 11,266
Material	$ 636,913	$ 688,483		$ 936,856	$ 636,913	$ 677,204		$ 871,260
BIM/Design/Engineering	$ 57,322	$ 61,963		$ 84,317	$ 57,322	$ 60,948		$ 78,413
Subcontracts	$ 45,576	$ 45,576		$ 45,576	$ 45,576	$ 45,576		$ 45,576
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Profit	$ 675,408	$ 733,785		$1,014,943	$ 675,408	$ 772,193		$1,238,334
	23.4%	23.5%		**23.9%**	23.4%	24.7%		**29.1%**

Amount of profit improvement associated with material mark-up recognition

Typical	Correct	Difference	
$ 936,856	$ 871,260	$ 65,597	1.5%
$1,014,943	$1,238,334	$ 223,391	5.3%
		Profit gain =	**3.7%**

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Within the construction industry, Dr. Perry has developed the concept of Agile Construction®, conducted and published research projects for industry associations, and developed the only standard for job productivity measurement with ASTM, which is utilized in MCA, Inc's support of Software as a Process (SAAP®) through the WEM® software suite of products, including JPAC®. In addition, he has worked with hundreds of contractors to improve productivity and processes both on construction projects and within the contractor's overall operations. Dr. Perry can be reached at 810-232-9797 and *perry@mca.net.*

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Phil supports MCA, Inc.'s research into Digitalization, Commonization, and Interconnection™ with a focus on visibility of contract changes throughout the construction project life cycle, starting with the company's pipeline and backlog. Within the construction supply chain, Phil has researched Externalizing Work® through prefabrication and helps companies layout efficient fabrication and distribution methods. Phil also supports sharing both the needs and wants between contractors and vendors to maximize construction system productivity to help clients implement the research results effectively into their businesses. He has participated in publication of both research and case study results and has a BS in Mechanical Engineering as well as an MBA in Technology Management. Phil can be reached at 810-232-9797 and *pnimmo@mca.net.*