Task Diminishment: Construction value loss through sub-optimal task execution

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Abstract

Ledbetter & Burati [1] defined quality as "conformance to requirements." This definition assumes that a requirement has been communicated, and mutually accepted by the contract purchaser and the contract holder. This research describes the persistent, or undiscovered and un-restored lack of conformance to requirements as value loss in the delivered project. Construction value is lost through sub-optimal execution across all tasks and events throughout the construction process. This sub-optimal execution is failure to conform to a task requirement. The contract purchaser (client) expects to receive a specified value through letting a contract to a construction service provider (contract holder). When the project is delivered, it may be significantly devalued compared to the expectations implied in the contract documents. Tasks executed in a non-conforming manner, which are never discovered through normal QAQC process and are therefore never corrected or restored, remain in the delivered project to degrade the project/contract value. These diminished tasks, persist across all trades, disciplines, and specialties in the construction process. This task diminishment impacts all tasks from the contract purchaser, and the contract holder – all tasks can be diminished through poor task execution. Diminishment of tasks from both the contract purchaser, and the contract holder, can rob the project of its implied or expected value. The task diminishments are un-restored, and uncorrected during the construction phase, and linger to degrade the value of the delivered project.

Bertelsen and Koskela stated that construction is a transformation and flow process which generates value for the client [2]. This value is a purchased asset in construction, typically defined by a set of client expectations. These expectations are defined and implied by project specifications, plans, terms and conditions and contract documents. The contract purchaser (typically an owner, prime contractor, or municipal agency) purchases value by letting a construction services contract. The various construction service providers, or contract holders (vendors, consultants, contractors, etc.), on the other hand, are obligated through the exchange of fiduciary consideration to provide the value expressed in the contract documents.

Unfortunately, the actual value of the delivered project will usually be less than the expected value of the purchased project -- sometimes far less. Sub-optimal execution of events, or

tasks, degrades value throughout the project duration. Poor task execution that is never discovered or restored, can lead to value degradation, or value diminishment during the construction process. The accumulation, or stacking effect of these diminished tasks can represent a significant loss to overall purchased project value.

Tasks are diminished in all trades, independently. Task diminishment by constructors is not due to task diminishment in design. Task diminishment in the defect liability period is not the results of task diminishment in the construction phase, etc. This is an important and difficult concept for quality researchers to understand. However, a bad design executed properly can have no task diminishment associated with it. Task diminishment only exists when a specified design or construction task is not executed to its specified condition. Some examples of task diminishment from the case study are as follows:

i.) Example 1: Non-conformance costs, Proofrolling – contract requires any area of deflection greater than ½" to be removed and reinstalled with clean backfill. Photographs submitted by the prime contractor on a pay applications showed several areas exceeding 1" deflection. Interviews conducted with the testing company and the prime contractor's superintendent shows that neither was present for the proofrolling. The site contractor did not say anything and allowed the proof rolling to continue.

- Task diminishment$_1$ – site contractor should have restored to the areas which showed greater than ½" deflection during the proof rolling (as specified in the contract documents). This would be degradation on the value of the site work contract which was $511,720. An estimate of the repair of gross area showing greater than ½" deflection was approximately $32,890 for a total diminishment of 6.4%, assuming this was the only diminishment on this contract.
- Task diminishment$_2$ – Quality control inspector should observe all work requiring inspection. Work should not progress without inspection as specified in the contract. This is value degradation to the value of the QC inspector's contract of $38,000. Estimating an inspection fee for this work at $1600.00, this is a total diminishment of 4.2% assuming this was the only task diminishment on this contract.
- Task Diminishment$_3$ – Ultimately the prime contractor is responsible for contract value. The non-restored value on the proofrolling shows value degradation to the prime contractor's quality obligations to the contract. GC supervisory fee on this project was $344,000, therefore the cost of this diminishment was estimated at $32,890 for a task diminishment against the GC work of 9.6%. As you can see, this diminishment was accrued three times. This does not overstate the value of the diminishment, because the client paid for quality supervision fees with the GC, on the site contractor's sub-contract mark-up, and through an independent testing contractor.

ii.) Example 2: Non-Conformance Costs, Roof Membrane Installation – contract

requires overlapping of roof membrane over parapet walls and fastening with continuous bead of bonding adhesive to the parapet wall prior to coping installation. Coping to be installed not later than four days after membrane installation. Roofing contractor did not fully fasten membrane to parapet walls, leaves without communicating to the prime contractor, and does not return for more than two weeks. A rain storm during this period showed ponding water against the membrane/insulation board interface. No insulation board was cored or replaced after these storms.

- Task diminishment$_1$ – roofing contractor does not adhere overlapping membrane continuously to the parapet, exposing membrane perimeter and rigid insulation boards to weather damage. Coping is installed two weeks after membrane installation. This is value degradation on the roofing contractor's contract (whether or not the rigid insulation board is actually weather damaged or not). Deviation from the specifications, without approval for substitution, is still value loss, because it represents non-conformance to the purchased contract. Diminishment was estimated at $7,200 as a conservative value for partial insulation board replacement. The contract to the roofing contractor was $265,000, therefore this is a diminishment of 2.71% if this is the only diminishment on the roofing contract.
- Task diminishment$_2$ - Insulation is not cored or checked by prime contractor to ensure that insulation was not damaged due to non-adherence to parapet walls. Prime contractor should have ensured that coping was installed during the time frame specified. This is a diminishment to the prime contractor's contract obligation. Schedule and specifications were not met. The $7,200 also represents a diminishment from the prime contractor's contract of $368,290, or a 1.96% diminishment.

iii.) Example 3: Administration – Contract allows 6% mark-up for the prime contractor on a sub-contractor's contract. A change order request is submitted to the CM/Architect and approved with an 8% mark up (multiple infractions)

- Task diminishment$_1$ – prime contractor erroneously submits change order request for 8% mark up. This is task diminishment on the prime contractor's contract and expresses a loss value to the project. Total overpayments on this contract were $12,365. This represents a task diminishment on the prime contractor's contract. The prime's supervisory fee was $289,612 for a total diminishment of 4.3%.
- Task diminishment$_2$ – CM/Architect staff failed to catch the increased mark-up on the change order request and recommended payment to the client. This is value degradation to the CM/Architect contract. The diminishment to the CM contract was $12,365 over a $166,000 contract for a diminishment of 7.4%.

The accumulation of task diminishment losses over the life of the project can be significant. From the case study provided, the value of task diminishment was 16.44% on audited

contract values of $120 million. Not only is the construction industry suffering crippling productivity losses, but the tasks that are actually being accomplished are being executed at around 83% effectiveness due to task diminishment. The contract purchaser must use capital or expense funds to compensate for the losses. A by-product of task diminishment is the ineffective deployment of capital funds and higher uncorrected waste being introduced into the construction process. In the case study, the almost $20 million in value loss represents funds that could have been re-deployed more effectively.

If quality errors are discovered by a quality control inspector on site, or otherwise within normal QAQC controls, and repaired, then the value is restored to the contract. This is not considered task diminishment because there is no value loss. Rework, or correction of non-conformance issues act to restore value to the project, therefore there is no value loss. This is another area where this research differs from previous research. Previous researchers typically look at rework, or non-conformance costs as a typical method for assigning loss to a contract holder (contractor, consultant, etc.). The construction service provider who conducts rework may (or may not) experience a reduction in profit margin, but as long as the rework is completed per the original specification, then the contract value is restored to the contract purchaser. Any rework, or warranty work completed within or beyond the defect liability period, can be seen to restore contract value – it is not a value loss to the expected value of the contract.

This research examines diminished tasks, un-restored, or partially restored in the construction process. A series of defects are discovered outside of the normal QAQC processes, which were un-restored to their specified condition. These defects are then annotated and assigned a value through a typical construction costing methods, and logged into a living audit log. The log continues to be updated as examples of task diminishment pass vetting procedures as of the date of this submission.

It should be noted that fraud is task diminishment. Task diminishment is as often purposeful, as it is incidental. Laziness, lack of time management, ambivalence, poor morale, poor supervision, sabotage, and fraud are all forms of task diminishment. Fraud is listed in this research inclusive with other 'administrative loss' examples. Task diminishment occurs any time work is conducted at variance to the manner it was specified in a contract document. Fraud is described by this definition.

The diminishment of the project value through a set of degrading factors throughout the construction process can be summarized in a number of discrete 'loss buckets'. A partial list of these value degradation buckets are: non-compliance to quality specifications; administrative/process inefficiencies which lead to loss – including fraud; warranty recovery loss; sub-optimal deployment of legal strategies; non-recovered errors and omissions losses from consultants; non-compliance to specifications not related to quality delivery; and failure to collect a legitimate credits back to the funding party.

Task Diminishment impacts most construction projects, but it is applicable to any funded activity. Any large funding program, which diminishes in value due to sub-optimal

execution, represents the variance between expected delivered value, and actual delivered value. Katrina victim funding, for example, is a case where the expectation of the delivered funds, was not fully realized. The variability in this funding expectation through fraud, administrative errors, and lack of process controls is an example of task diminishment [3].

Although task diminishment may be a new way to examine value loss in the construction industry, it is not necessarily a revolutionary concept. Supermarkets track task diminishment on a monthly basis, although they call it 'shrink'. Shrink routinely erodes from 2% to 4% of profits annually from the super market industry [4]. Coupon issuers not only track task diminishment, they count on it for revenue. In the coupon issuing industry, task diminishment is regarded as 'breakage,' or 'slippage' [5]. Airlines lose about three millions pieces of luggage per year due to task diminishment. About two per cent of this amount will remain lost [6].

Review of Literature

Bertelsen and Koskela describe construction as a value generator for the client. These two researchers also describe how the value is delivered to the client: "a series of processes; forming a workflow drawing on transformations delivered by the trade contractors under a contractual arrangement with the client – either direct or through a GC."[2]. If this purchased value system delivers the value desired by the client through the contract documents as Bertelsen and Koskela describe, then what degrades, or diminishes that value? This is rarely discussed in the research.

Several researchers have veered closely to the premise of this research by describing impediments to task completion. Koskela outlines seven preconditions to a construction task, and how variability in these preconditions prohibits task completion [7]. In concert with Koskela's theoretical view, Ballard and Howell discuss how execution problems and quality failures prohibit task completion. Ballard and Howell estimate productivity losses can be around 40% for assigned tasks [8]. A staggering number, but very similar to the conclusions found in the annual Proudfoot global productivity study [9]. However, these researchers describe a productivity loss problem. Task diminishment, as described in this research is not typically related to productivity loss. Task diminishment describes the value degradation on tasks that are executed, rather than the loss incurred due to not accomplishing the task.

As mentioned, previous research has viewed losses in construction from the perspective of the construction service provider (contract holder), and deal mostly with quality and productivity loss. Quality loss, or the Cost of Quality (COQ) in the construction industry has been examined variously as the cost of quality (COQ)/quality loss by Burati et al, 1992 [10]; Love and Li, 1999 [11]; Aoieong, Tang, and Ahmed, 2002 [12]; as rework costs by Love and Sohal, 2003 [13]; as quality deviations by Burati et al., 1992[10]; as non-conformance costs by Abdul-Rahman, 1995 [14]; as quality failures by Barber et al., 2000 [15]; as wastage by Alwi, et al, 2003 [16]; as productivity loss by Bertelsen, Koskela, 2002[2]; and as rework and conformance costs by Abdul Rahman, 1999 [17] and by Love, Li and Irani, 2003[18].

The general analysis of quality loss in previous research states that 'some reason' causes the construction service provider (contractor holder) to have to do certain work tasks more than once, or less efficiently than originally planned. The 'some reasons' vary widely from researcher to researcher. Basically, rework required more labor and material to restore the task to its specified condition, and therefore additional cost was unnecessarily expended. The researcher typically annotates each observed incidence of rework or wait-time as a loss, and then accumulates that loss over the duration of the project. Then that loss per cent is extrapolated across industry-wide construction expenditures and assigned per cent to total loss figures.

Aoieong et al. (2001) also came close a central theme of this research when they described the prime contractor's disinterest in the quality breakdowns associated with the sub-contractors. According to Aoieong, et al.: "From the general contractor's point of view, most contractors interviewed indicated that they were not enthusiastic about obtaining facts on quality costs. This is simply because most of the projects are [sub] contracted out, and only the final 'product' and not the process is their concern [12].

Aoieong et al.'s research understood that the prime contractor is the 'contract purchaser' in his survey, and is purchasing a set of value expectations. The prime contractor according to Aoieong's research, must be concerned with receiving the value of the purchased sub-contracts. Therefore, the contract purchaser is not concerned if the sub-contractor has to conduct rework, or non-conformance repair in order to restore value to the contract. The prime contractor in Aoeiong's research probably understands that rework for a subcontractor may – and it's by no means certain – erode profit for the sub-contractor, but it restores value to the purchased contract. As long as value is restored to the contract, then the contract holder is not overly concerned with the level of rework needed to deliver that value. Aoieong did not mention if the prime contractor was concerned with quality and process diminishments that were not discovered during the project duration [12].

Only the defective work that this not discovered or corrected during the defect liability period represents a loss – or degradation in the delivered project value. This was underscored in Abdul-Rahman's survey on Quality cost loss. A QA manager for a construction service provider responded to a survey question with the crux of this issue: "Site management will record the failure of others [subcontractors]; however it's the unrecorded [failures] that holds the key." [17].

Methodology

An audit was conducted on $120 million worth of construction contracts, for a retail/commercial development company who spends approximately $4b in capital upgrades annually. The audit identified and analyzed all non-recovered loss examples, their cause, reasons, documentation and comments from stakeholders. This audit was not a financial audit, nor was the audit exhaustive in any manner. The researcher examined archived files from 2002, 2003, 2004,and 2005 during this audit. Specifically, defect notices, change orders, quality reports, bid documents, photo journals, arbitration transcripts, pay

applications, close-out punchlists, warranty logs, defect claims, quality reports, and open work order reports. Variability in any of these documents was annotated and investigated. The investigation on variability ultimately led to a vetting process which included stakeholder interviews, and costing exercises. The investigated item was identified as a value loss – or not – and costed as appropriate. The amount of the contract associated with the loss was either retrieved from the file, or from the prime contractor, or estimated from historical knowledge. A per cent total value loss was then assigned. The losses were then logged into an audit log.

The audit and interviews have logged 261 examples of value loss through 2005. However, due to the amount of task diminishments identified, to date, literally hundreds of value loss examples that have not been vetted and logged. These have been retained in an electronic file for logging at a later date, but have no bearing on current research. As these items pass vetting procedures and are added to the audit log, then the research figures will fluctuate minimally, but it will not impact the premise of this document. Additionally, subsequent to the audit which lasted for approximately six months from August, 2005 to December, 2005, examples are collected in the normal course of work practice for logging, investigation, and recordation.

In addition to file audits on historical projects, site visits were conducted on works in progress outside of normal protocols. If the researcher discovered defects through these site investigation then the defect was recorded as a value loss. The normal quality control methods, and process control methods did not include site investigation from the researcher as a means for controlling quality or processes. If the prime contractor's superintendent, the quality control contractor, the trade foreman, or the owner's representative did not correct a defect on site, and it was discovered by the researcher, this was assumed to be outside of normal process control methods. These types of defects were logged as value losses.

Diminished tasks were those that were discovered exceptional to normal project controls and processes. If a defect is noticed within normal QC process, or through the normal process control procedures, and restored, then this is not lost value, and not logged. If a loss was discovered by the quality control contractor, and the project manager and the contractor were notified through a defect report, and the item was corrected (even though it caused rework), this was not task diminishment. Task diminishment only identifies un-restored value loss outside of normal controls. If a defect was noticed, and it was beyond the work sequence window, a remedy may have been negotiated and accepted by the contract purchaser/client. This may represent a diminishment depending on the condition of this negotiation. If the negotiation is contingent on a desire to settle in order to avoid litigation, then this may represent a task diminishment based on the value of the original work.

If the research revealed a defect through the process of the project audit, remedy was not pursued even if the diminishment were with in the defect liability period. The researcher did not send a remedy claim to the contract holder for a defect discovered in the project audit. Providing remedy for diminishments was not within the scope of this researcher. Therefore if a defect was noticed on a recent project (within the defect liability period), the scope of this

research did not include issuing a defect notice, or seeking remedy. The defect was simply annotated as a task diminishment because it was discovered only in the course of the research, rather through normal QAQC and oversight procedures.

Case Study – Big Box Retailer

A study was conducted with a large retail developer which analyzed capital improvement project contracts worth $120 million. From this analysis, task diminishment was observed at a total value loss of $19,873,606, for a loss per cent to total of just over 16.44%. The 16.44% in losses associated with task diminishment were more significant than the original assumptions, but conservative in light of its potential loss. It is important to remember that the audit was incomplete, and lacking thoroughness. The total losses mean that the owner receives about 83 cents of value for each 100 cents expended. If previous productivity research is correct, then before the execution phase starts, the contract is already starting at a diminished value.

Task diminishment resulted in value loss in five main categories: quality/non-compliance loss; third party work non-compliance; design errors or omissions; legal costs associated with negotiations to avoid litigation; loss associated with failure to collect warranty, or other uncollected credits due.

Table 1. Task Diminishment Buckets

NCQ	$6,900,155	34.72%
Admin/Process Loss	$5,580,161	28.08%
Warranty Recovery	$4,235,654	21.31%
Uncollected Credits Owed – EO, Procurement, 3rd Party	$2,480,164	12.48%
Legal-COLA	$677,472	3.41%
Total Loss	$19,873,606	100.00%

Non-Conformance - Quality Loss

Quality degradation during task execution was the largest contributor to the total observed loss from task diminishment. Quality losses of $6,900,155 (34.72%) were observed during the project audit analysis. Quality degradation occurs every time a construction task was performed in variance with the specified task outlined in the contract documents.

There were 261 examples of un-restored defects provided in the defect log (includes all categories). Random examples of quality defects include: improper utility backfill procedures; failure to replace joint material prior to the warranty period expiration; improper joint filler installation; sub-optimal sub-grade construction; improper backfill procedures,

incorrect welding, poorly trained quality observation; improper slab construction; poor roof installation procedures; improper electrical installation procedures; highly variant asphalt concrete paving thickness; welds are skipped, or not full-penetration; roofing membrane is not adhered according to the contract, and oversight errors. Utility backfill trenches are back-filled haphazardly instead of in a controlled manner (as specified). Backfill or sub-grade is compacted minimally, and corrected only if a proof-roll or proctor density tests fails, and a defect notice is issued. Dock sub-grades were constructed over poorly bearing soils. The contractor knows that hurrying through a backfill compaction, and then repairing parts designated by a 3rd party quality control inspector is less expensive, than controlling the entire pad construction. Concrete is poured too dry, too wet, beyond its psi allowance or below it. Remedies are discussed, but never consummated. Quality breakdowns are exceeded all along the execution spectrum. Those items subjected to corrective notices are corrected, but the quality defects not caught by QAQC are not corrected. Even with 3rd party quality control, mistakes are rampant.

From our original example, when the backfill specification is not followed, what is the cost or loss to the client? The cost could be revealed in life-cycle maintenance costs. The cost could be the amount it takes to fix the subsiding trench. In one case in West Fredrick, Maryland in 2004, a utility trench subsided so much that it impeded forklift traffic trying to off-load delivery trucks. The warranty claim was not perfected because the warranty holder did not respond to the first dispatch, and chose to contest the claim as it was shortly beyond the defect liability period. Store operators needed it fixed right away because forklifts could not off-load delivery trucks. Therefore a service provider was called to enact the repair at a cost of $13,644.00. This was task diminishment for the utility contractor, the prime contractor, the quality control contractor, and the warranty manager. The value of this task diminishment is $13,644.00 from a contract of $344,817.00 to the site/utility contractor. If this was the 'only' diminished task on the utility contractor's contact, the task diminishment would be 4%. West Fredrick was partially audited during the audit phase with forty-one examples of task-diminishment for a total value loss per cent of 6.38% for this project.

There does not need to be a specific cost associated with non-compliance work for a loss to be realized. If specifications are circumvented, or subverted or otherwise not followed, then the delivered project is less than the expected project. The owner expects the utility trenches to be back-filled per the specifications in the bid documents. When the backfill specifications aren't followed, the owner receives less than he paid for, regardless if the trench subsides or not.

Administrative Value Loss

Administrative/process losses were the second largest value loss category with a total loss contribution of $3.8mm (32%). Administrative and process losses included a varied list of process items that – when diminished through poor task execution – led to value loss. These broad and varied administrative losses include tasks such as: staff contract administration error by approving changed contract items that were part of the original contract; allowing mark-ups from sub-contractors to exceed the contract allowable limits; not filing appropriate

reports or documents and receiving fines; duplicating orders and not tracking returns; not properly auditing over-budget projects for duplication charges or other misclasses; failure to track and recover escrow accounts filed with municipalities or cities; allowing price increases for materials when contract specifically excluded them; not reviewing or administering technical reports and defect notices; or failing at other administrative/process obligations which resulted in value loss, and etc. Fraud items (excessive billing, double billing, mark-up errors, billing for contract work, etc.) was included in the administrative process loss category. Theoretically, if the process tasks were undiminished, then the fraud losses would not be possible, therefore they are considered an administrative/process task diminishment. This positively correlates with the Proudfoot global productivity study which found that management/staff errors were the largest contributors to productivity loss [9].

Incidences of fraud were recorded in this category. These examples of fraud are not the egregious examples that are typically found in the newspapers. Fraud discovered in the project audits typically meant over-billing, duplicate billing, using back-up for contract work to substantiate change order work; billing for unapproved costs; billing higher mark-up than allowed by contract; and billing contract work as changes. Because it was impossible to state that these examples were specifically fraud, and not 'mistakes', these were not tracked separately but were included in the 'administrative' category.

Warranty Value Loss

Failure to recover warranty was the third largest contributor to the value degradation observed through task diminishment. The inability for the owner to recover warranties on defects discovered during the defect liability period amounted to $4,235,654 (21.31%) of the almost $20 million in total observed losses. Warranty recovery losses are realized when the client purchases a service contract for specific work, and then encounters work defects which are not remedied by the warranty holder. When a warranty item is identified, and the warranty value is not received, then this is identified as value loss through diminished warranty recovery execution.

The client in the case study had very accurate and precise methodology and tracking tools for warranty recovery on new developments. The client utilized an in-house maintenance call center for day to day maintenance calls for their facilities. Part of this call-center was dedicated to new-development warranty calls. After the facility was commissioned, and calls came in for repairs or defects, the warranty caller was dispatched by this call center. Further, the reporting mechanism for warranty recovery was accessible, and thorough. Warranty calls were logged in, and logged out as complete. In some cases, duplicate dispatch orders were placed if the issue at the facility required immediate response, and the warranty holder was delayed. There was no recovery for these instances, and obviously, the warranty holder was incidentally rewarded for 'dragging their feet.'

The reporting of these cases was easy to audit. Work Order History report was provided for each project in the audit analysis. The Work Order History report showed which work orders were dispatched to the warranty holder, which ones to the repair contractor, and which work

orders were not responded to by the warranty holder, and eventually re-dispatched to the repair contractor. Also, mistakes were made in the dispatching periodically, so that the repair contractor was called out rather than the warranty holder. This reporting system, and warranty recovery process was one reason it was relatively easy to audit this function, and for the relatively high per cent of warranty recovery . . . about 84%.

Uncollected Credits

Throughout the construction process, the client was due credits from various sources. Uncollected credits from various vendors, consultants, and change orders totaled $2,480,164, or 12.48% of the total losses of $19.8 million.

Redundant purchases from the client were made in order to keep the project on schedule. It was stated at the time that rather than doing an investigation as to what happened to misplaced material, the order was placed again and managers stated that 'they would get the credit later'. However, outside of the manager's own follow-up, there was no mechanism in place to record this credit, and centrally track it credits owed. The on-site contractor was supposed to conduct a detail receipt in order to ensure all the material was in the order. Much of these orders were 'Furnished by Owner' (FBO) product. The contractors on site did not want to break open the orders and conduct a lengthy material audit. The client, in order to pay the manufacturer on time, conducted a 'good's receipt' in the centralized office. Later, if parts were not shipped by the manufacturer, or lost by the contractor, or mis-ordered by the client, it would be impossible to tell where the error originated. The contractor simply stated that the material was short, and the product was reordered and expedited to the site. These duplicate orders and expediting fees were proportionately credits owed to the client, and remained uncollected due to process errors.

Similarly, errors and omissions from designers and consultants were acknowledged in the process. Again, because there was no formal process to bill back, or collect credits due, most of the credits owed were not collected. Not all credits due were left up to the individual managers to run down. Real estate deal credits from landowners were centrally tracked and reported. These types of credits owed were part of the development agreement, and were transferred to a centralized tracking group – Real Estate Accounting. This group provided monthly reports and helped the field groups track and chase down the credits owed. Most of these were collected. Process credits through imperfect execution of the process stakeholders, however, were left up to the individual manager to collect. No centralized process existed. Some manager's were able to collect some credits, but because procurement was a centralized function, with no real transparency to the project management team, these duplicate orders were almost never recovered. In fact, the only recovery made on duplicate orders were the salvage dollars received for throwing out brand new racking materials, because of the over-ordering. that resulted in non-recovered costs made up 2.47% of the total losses, followed by developer's who failed to execute their small portion of the overall contract comprised the remaining portions of the twelve million in execution losses.

Credits due from contractors were mostly recovered because there was a rote process in places for contract changes, including credits due. Credits from the contractors were diminished in part by negotiations with the client. There were losses recorded during these negotiations, because the final credit do the client did not always equate to the work not done.

Few credits were recovered from civil engineers, geotechnical firms, and architects. Although there was evidence of errors and omission in almost every project audit, few of these errors were ever recovered. In some instances, the consultant admitted to the error, but no recovery was made, even when reimbursement was acknowledged and promised.

Inefficient Legal Deployment

Inefficient deployment of legal resources made up 3.41% of the total losses, or $677,472 on $20 million in losses. Most of this inefficient deployment was due to organizational bias to settle disputes regardless of attempting to proffer the case for adjudication. The trade-off decision based on estimates of costs of litigation is typically an inefficient decision tool, and may be related to other reasons for not pursuing formal adjudication. Regardless, the strategy does not follow linear application and is incongruous to the purpose of seeking remedy or redress. The study of legal application in construction remedies should be examined in broader context. It was difficult to assess the value loss of this strategy. It is possible that in some cases it is more prudent to settle cases than to litigate. Only those cases where the claim was determined to be very strong were analyzed as a loss, and these were estimated very conservatively. The dollar amount lost represents the difference in the settled claim and one-half the featured claim. For example, if part of a settlement featured an $88,000 concrete polishing contract, and the amount settled was less than one half of this contract, then that difference is recorded as the loss. In the case of the concrete polishing, the amount was settled for $25,000 as part of the legal negotiation. Therefore the loss was recorded as $19,000. The examples of inefficient deployment of legal resources are a relatively common occurrence, and although it represents a smaller portion of overall task diminishment, it appears to be a recurring problem.

Conclusion

The construction process includes multiple phases, and hundreds of tasks. Task diminishment potentially impacts all of these tasks. Task diminishment should not be considered an indictment on trade construction, or construction in general. Task diminishment occurs on every phase in the construction process including planning (entitlements), design and permitting, construction, defect liability and close-out. The expectations implied in the contract documents are supported by the exchange of financial consideration. These expectations describe how value will be delivered through the work, or through the Transformations discussed above. Therefore, if the execution of the task is sub-optimal, or otherwise does not meet the expectations in the contract documents, then value is degraded.

Contract purchasers need to understand how value is diminished on a delivered project. Contract purchasers should understand that QAQC programs do not prevent all quality breakdowns, and warranty recovery programs do not recover all warranties. Within these programs, sub-optimal execution degrades the effectiveness of these programs through task diminishment, and value erodes as a result.

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Biography

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