SYM-AM-18-108

PROCEEDINGS
OF THE
FIFTEENTH ANNUAL ACQUISITION RESEARCH SYMPOSIUM

THURSDAY SESSIONS
VOLUME II

Acquisition Research:
Creating Synergy for Informed Change

May 9–10, 2018

March 30, 2018

Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

Optimizing Contract Modifications Under One Universal Mod

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Abstract

This paper looks into the process known as concurrent contract modification (CCM) and proposes a solution to automate it. While CCMs are not inherently disallowed, they do present contract logistical and administrative problems. The larger projects become, the more difficult it is to track, administer, and document proposed changes. Without an efficient means toward managing incoming changes, gaining any tangible and accurate reporting on project outcomes proves significantly challenging if not impossible.

What this paper proposes is a new approach to contract change management utilizing a software tool designed for ground-level operations that scale up to Contract and Program responsible stakeholders. Instead of relying on the output of contract writing systems, this system can be used to manage the execution of several related contracts under a single project with shared sources of funding. Focusing on automated infrastructure and a process for contract change management will allow for greater insight and accountability at program execution levels, in the case of the Navy, at the Regional Maintenance Center or Shipyard level.

Concurrent Modifications, The Act of Optimizing Multiple Contract Changes Under One Universal Modification in the Acquisition, Maintenance, and Program Management of Large Military Sea, Land, and Air Platforms

Introduction

This project explores whether current processes for contract modifications can be optimized to better respond to today's environment of rapidly changing requirements due to unforeseen events that occur during the building and maintenance of large military sea, land, and air platforms that affect delivery, cost, program management, and planning.

Critical variables that affect acquisition and maintenance efficiency include emergent technologies that impact outcomes and contribute directly to unforeseen cost overruns. The rapid pace of technological change creates challenges to the acquisition community due to requirements that may not always be fully known at the time of contract award. Currently, changes for any reason require multiple contract modifications, which over time have become unwieldy and inefficient to manage; moreover, the cost impacts of multiple contract modifications have become difficult to assess, therefore making auditability difficult if not impossible.

Using the Navy's shipbuilding environment as the point of departure for the analysis, this project develops a proof-of-concept alternative contracting system that allows concurrent contract modifications, whether executed in parallel or sequentially, to be prioritized according to tailorable rule sets in a manner that allows users to monitor, manage, change and report total contract award in real time. This proof-of-concept also aims to provide solutions to other complexities inherent in today's contracting environment, such as allowing for multiple contract types within and between Contracting Line Item Number (CLIN) structures and within a single contract award, and the management of multiple Technical Instructions, CLINs, and SubLine Item Numbers (SLINs).

The aim of the final contracting system is to create the required data relationships in a single system for the purpose of monitoring contract cost and technical scope in real-time, thereby increasing transparency and auditability.

Examples abound regarding the difficulties the DoD has in forecasting cost and managing changes that affect key elements in the building and maintenance of large platforms. This is especially true regarding seagoing platforms such as submarines, carriers, littoral combat ships, and destroyers. These examples include the following:

- Through the course of a decade, the Littoral Combat Ship's program went from an estimated cost of $220 million per ship to an average currently at $478 million apiece, with more changes afoot (GAO, 2016).
- The Navy's number one budget priority, the Columbia Class Submarine, has already projected cost overruns before the first platform is even built due to uncertainties regarding critical emergent technologies (GAO, 2016).
- DoD Contract Management, Weapons Acquisition, and Support Infrastructure Management are all represented on the GAO's High-Risk Ledger.
- Cost overruns are imprecisely estimated and continue to provide challenges to the DoD that significantly impact performance and outcomes, in particular: shipbuilding. Multibillion-dollar cost overruns are common and, in many cases, expected.
- Documenting these challenges has proven difficult, affecting auditability, transparency, and effectiveness. This impacts the nation's leading edge in maintaining global military superiority.

Providing an optimized automated process for concurrent contract modification that reports situation awareness in real time will significantly add to the goal of excellence in DoD acquisition.

The aim of this proposed approach to concurrent contract modification is a process, supported by an agile software tool, to coordinate serial changes in projects that involve one or multiple contracts to increase acquisition excellence through concurrent modification, or "real-time" situational awareness. To quote Socrates, "Knowledge of the right leads necessarily to right acts" (Gilje & Skirbekk, 2017). Therefore, the aim of this project is to give direct real-time access to the execution of program funds and activities via the reporting of contractual transactions at an elemental granular level "in real time." This will allow Acquisition and Program Management stakeholders to have access to global and granular information that is critical to effective real-time decision-making that affects cost, planning, and delivery outcomes. In short, the purpose of this project is to provide knowledge in the form of global, granular, structured contextual reporting on all acquisition program management parameters in real time as to ensure the right actions are taking place.

The federal government has struggled with providing a consistent award and budgetary data repository that includes truly accurate information. For example, the Digital Accountability and Transparency of 2014, or DATA ACT, requires the federal government to transform its spending information into open data (Data Coalition Organization, 2018). However, there have been speed bumps along the way to its implementation. For example, in a report released by the GAO in November 2017 regarding DATA Act compliance, the GAO found that the consistency of required data submittals to BETA.USAspending.gov was faulty at very high levels. The agency found that "approximately 94% of all records … differed sharply between budgetary and award records," making any real decision-making and analysis based on those records false at the outset. Regarding award sub data, the GAO reported that the actual award information was "inconsistent with agency sources for 62 to 72 percent of all awards" (GAO, 2017). Another GAO report found that personal services contracts from the DoD lacked accurate data, therefore, "proper management of personal services and other contracts contained inherent difficulties that impact performance, reporting, auditing, and closeout" (GAO, 2017). This anomaly makes the lessons learned process, the budgeting process, and other critical elements affecting optimal acquisition all but impossible.

While this project could involve the creation of an entirely new acquisition infrastructure, this approach is not designed to replace enterprise-wide software systems for contract writing and reporting. The method proposed is intended to reside at the Contract and Program Management level to provide Concurrent Change Management to bring full accountability to all program elements, including budgets, task order, technical/task instruction, and funds expenditure. It is intended to provide for seamless collaboration, all integrated into one enterprise that provides real-time visibility and reporting capability into all project activities in "real time." This project provides for accurate reporting to the penny, cross-referenced to one or all relevant acquisition activity. In other words, truly accurate information that is currently lacking.

What Are Concurrent Contract Modifications?

Concurrent contract modification (CCM) is the process of simultaneously processing multiple contract changes against numerous contract vehicles that affect a project or program—for example, the $800 million maintenance project (Harper, 2017) for an Ohio Class Submarine in San Diego, CA. One concurrent modification of $800 million could include, but is not limited to, a dearth of actions including additions, deletions, new work, payments, new funding, additional option exercise, delivery schedule extensions, stop orders, and terminations. CCM exists due to the operational need to adjust contracts to suit ever-changing requirements rapidly in venues such as the Navy shipbuilding environments. CCM has no precedent in the Federal Acquisition Regulations (FAR), but the process is a unique agency-specific interpretation of the FAR regarding contract modification. The agency using this process is the Navy. Further complicating the matter is the scale of interaction between government staff and contractors in support of ship maintenance projects. As of 2017, the operating costs for the U.S. fleet was $56 billion a year. However, testimony before the Subcommittee on Seapower of the U.S. Senate Armed Services Committee projected that total Navy operating costs would increase to an average of $102 billion per year through 2047 (Labs, 2017). Shipyards such as Puget Sound Naval Shipyard and Intermediate Maintenance Facility IMF in Bremerton, WA, executed nearly 2.3 million-man days of work and employed approximately 12,340 civilians, accounting for a large percentage of the current budget (Bradlet et al., 2017). Managing these budgets and reporting on them in a format acceptable to key stakeholders inside and outside the DoD, including Congress, has proven to be a challenge. It's normally accepted that the DoD, particularly the Navy, is "un-auditable" (Nader, 2014). One of the current priorities of the Navy is to be fully auditable by fiscal 2018. An optimized Concurrent Modification Process and automated infrastructure contribute significantly to this purpose.

A simple analogy follows for the purpose of illustrating the logistical challenges of a large project with many contractors. This is a fictional example but with relevance to any project manager. In this analogy, there are contractors working on a multimillion-dollar boat overhaul project. This boat's maintenance schedule calls for it being homeported no more than three months. The boat arrives, and work begins with the 10 contractors and their subcontractors. About three weeks into the overhaul, one of the contractor engineers find that the engine assembly's wiring is in a complete state of disrepair and requires an urgent fix. The maintenance schedule did not foresee the need for the wiring to be worked on. Therefore the project management staff has to decide whether to issue a new contract, issue a change order to one of the 10 contractors, or issue an instruction. The staff decides to issue a change order for one contractor who specializes in electrical engineering. The electronic engineering firm tasked with rewiring the engine block has to replace the wiring as fast as possible because it will delay other contractors. That forces other engineering contractors to stop their current work. That stoppage prevents the other contractors from continuing or completing their work and so on and so forth. The work change order then forces the project management staff to adjust the other contracts to reflect a new period of performance, delivery or start dates, etc., for some tasks. As the project staff begins making changes to contracts, it creates a ripple effect that eventually will throw off the project's timeline, including the budget and the ultimate release of the boat back out to sea.

Therefore, as a result of constantly modifying contracts, the project management staff develops a way to make changes in bulk against all contracts and at a later date officially modify the contracts affected. In this way, the staff has a running list of all changes made to the project's contracts and can promptly issue work orders, changes, or modifications to keep tasks on schedule. For small projects, this is potentially workable, but for larger projects, this creates opportunities for errors, miscalculations, and reporting mistakes. For instance, what happens if the project has to make a change to a change? If there is a list of changes not yet officially modified into the contracts, what is the actual value of the contracts currently? How much has been actually spent compared to the budget of the contracts? In essence, the aforementioned antidote is what concurrent modifications are—the struggle of keeping projects on time and on budget while at the same time conforming to regulations on contract administration.

Continuing with concurrent modification, the main issue in the discussion toward optimal practice is the management of hundreds of requests for contract changes from end-user stakeholders, program managers, on-the-ground engineers, specialists, and project managers against multiple contract vehicles with various periods of performance, contract types, cost types, cost ceilings, and various contractors with different reporting requirements. Additionally, each contract could have separate administrative staff that could be geographically spread across multiple jurisdictions. Without a viable concurrent modification engine, tracking changes, ensuring funds are available, and handling critical actions such as technical reviews become more and more unmanageable. As a result, without a Concurrent Modification Infrastructure, changes are aggregated and the responsible contracting officers then "modify" the appropriate contracts at a later date.

In the meantime, contracting officers can, under certain conditions, authorize work to commence with the expectation that the contract will be confirmed later (Naval Regional Maintenance Center, 2013). The only issue here is that in most cases, the contract is never confirmed. This makes closeouts, accurate reporting audits, and other critical elements of the process all but impossible. These challenges reoccur with every class of ship and are an ongoing problem for the Navy. Adding yet more confusion to this process is the effect of change orders on different contractors and their ability to deliver on time and within projected costs. Additionally, chains of changes on one contract can have a domino effect directly as well as indirectly, forcing other contracts to be changed that affect a project. Without effective Concurrent Modification Protocols, the result is a significant administrative and paperwork backlog to conform contracts, resulting in significantly less efficient reporting and often no reporting at all. It's been said many times in Navy Pentagon Program Shipbuilding Offices that the choice is obvious: "Do we focus on building new ships or on closing out old platforms where there is no information available?" (Senate Armed Services Committee, 2015). We focus on building new ships. The fallacy here is that building new ships depends on lessons learned from building, maintaining, and closing out retired ships. If that data is consistently not available or outright lost, the problem is obvious. The Navy proposes alleviating this reality with Optimal Concurrent Modification functionality using new technology. This technology is at the forefront of this document.

Looking at the root issue of CCM from a pragmatic perspective, building and/or maintaining a ship presents a logistical problem regarding the program and contract administration. There exists no way to effectively track changes that everyone expects are bound to occur during the build or maintenance lifecycle. The lack of accurate and documented contract and program changes, especially those regarding award data, can be extremely detrimental. Take, for example, mandated systems such as the Federal Procurement Data System–Next Generation (FPDS–NG) and data integrity. A December 2016 Congressional Research Service Report on Defense Acquisitions Spending and Reporting warns that "decisionmakers should be cautious when using reported obligation data from FPDS to develop policy or draw conclusions. In some cases, the data itself may not be reliable" (Schwartz, 2016). While this paper will not make a judgment against the efficacy of FPDS–NG, the main theme of complaints regarding FPDS–NG is the lack of accuracy and missing information in system data sets. The Department of Commerce, Office of Inspector General (IG) in 2015 found that the department needs to improve the "process for entering accurate and reliable data into FPDS–NG and its controls to properly maintain and safeguard contract files entered into the system." The IG found that undefinitized actions (UAs), contract actions issued as letters contracts, and other instruments used to meet an urgent requirement of an agency contained coding errors due to a lack of training. However, more distressing, the IG also found that actual "contract files and FPDS–NG data sheets were missing" (Office of Inspector General, 2015), rendering the information all but useless to the informed user.

In the DoD, the lack of an adequate process to track contract changes and their award dollar obligations has had disastrous effects on public and congressional relationships. These issues range from the Army's $6.5 trillion of "wrongful adjustments" in 2016, where the Army lacked receipts and invoices or simply made them up (Paltrow, 2016), to the Navy's massive procurement scandal involving the ongoing investigation within the Navy involving ship support contractor Glenn Defense Marine Asia (GDMA), a subsidiary of the Glenn Marine Group, "Fat Leonard" scandal (Paul, 2017).

The key takeaway from one review of these events is the need to improve methods for creating, managing, and generating award data that allows for a contextual understanding of the data sets. Understanding such sets will improve efficiency, create effective work solutions, and as an added benefit, catch waste fraud and abuse. An improved method for creating, managing, and generating award data will also enable easy, intuitive learning curves for end users on the ground, those that live and breathe the project. By giving end users easy to learn, easy to understand, and easy to use methods for direct involvement into the processing and reporting of contract changes, users in the field will acquire easy tools to do their work and contribute to efficiency and delivery outcomes. Rather than waiting for official audits and reports, the system proposed will give end users, privileged managers, and stakeholders the ability to recognize anomalies quickly and provide for prompt cost and time-saving response. For example, in a 2016 paper on procurement fraud in the DoD, the authors posit that "shifting the first line of defense against procurement fraud should be the procurement workforce managing the contracting process," not the contract auditors and fraud investigators. They added that "missing from the DoD's response to procurement fraud risk is a more strategic approach to fraud deterrence and detection that includes emphasizing procurement workforce training, contracting process capability, and internal control effectiveness" (Rendon & Rendon, 2016)

The challenge to solve is not only to automate the submission of changes, types of changes, contractual conditions, approvals, and notifications, but also to also track these actions in real time, with the end goal of producing elemental or granular data on each contract action. Information such as who made the request, who approved the changes, which account/ACRN was obligated, who is the contractor, where exactly is the place of performance, what was ordered, when invoices were paid and by whom, and lastly, why does this change need to happen and how does this change impact the outcome of the project.

Proposed Design Proof of Concept Research for Concurrent Modification Management and Alternative Contracting System

This section will explain system design, processes, and outcomes. As an overview, the proposed method addresses the following challenges in concurrent modification:

1. Multiple modifications executed in parallel with numerous accounting classification reference numbers (ACRNs) targeting various Subline Item Numbers (SLINs)
2. Various task or technical instructions
3. Multiple Contract Line Item Numbers (CLINs) dictating different contract reimbursement types, i.e., fixed fee vs. cost reimbursable vs. a combination of the two
4. Reconciling the previous items to determine total contract award in real time, for monitoring and managing CLIN ceilings
5. Warehousing large volumes of ancillary data electronically in an easily accessible format

This section is broken down into two parts: the design philosophy and business process explanation. From a computer software design and acquisition perspective, the wording and terminology are simplified. The particular case with concurrent modifications is, generally, a Navy-centric process, and terminology and policies may not or do not apply to other branches. This section attempts to encapsulate and generalize procurement process concerning software systems. The intent of the authors is to break down the government procurement process to the root elements and define capabilities for the design of a system.

Design Philosophy

The system is designed to address several challenges in the contract modification process.

1. Efficiently managing contract change requests with large groups of contracting specialists, requirement holders, managers, and contractors
2. Tracking approved changes and budgetary implications
3. Aggregating changes and applying legal modifications to groups of related contract vehicles
4. Creating data model linkages between budgetary accounts, contract level funds, and expenditures on the line item level
5. Enabling detailed expenditure reporting against contract modifications, in real time.

To summarize the process, a method of rapid change management and tracking called the Rapid Contract Change Management Model, or bicycle model, is introduced in Figure 1. The procedure outlines three areas of focus: the contracts represented as the seat, the left cycle representing change management process for requirements holders and managers. The gear or center represents the aggregation and reporting of priced and unpriced changes; the right sequence represents the legal contract modification process for contracting specialists. Lastly, reporting represent the handlebars that connect the contract.

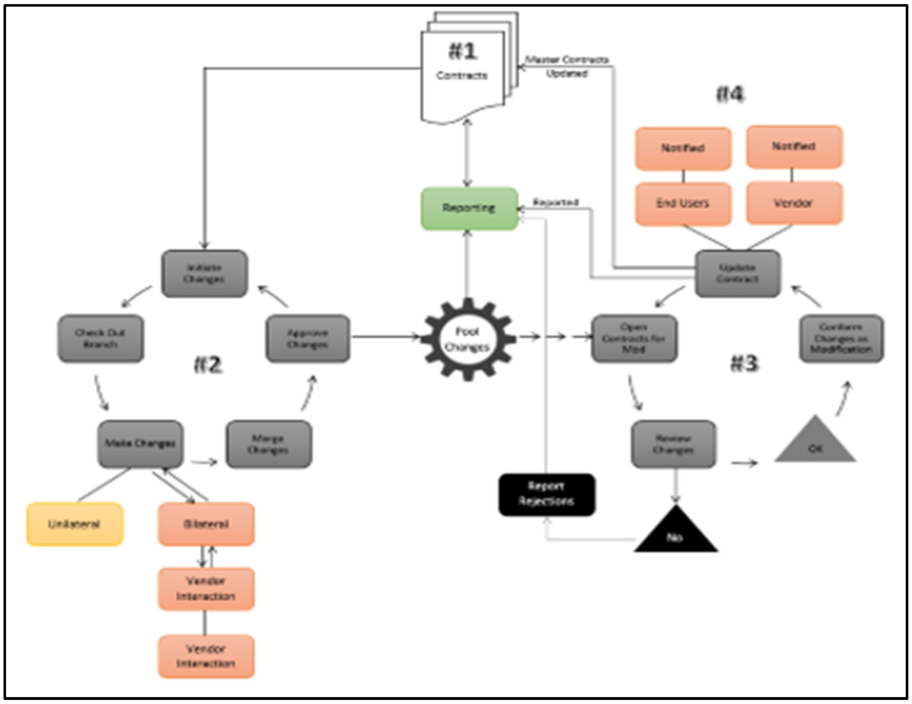

Figure 1. Bicycle Model

The model is designed to support three different stakeholder groups: requirements holders/managers, contracting officers, and specialists. The model is also designed to bind the various stakeholder groups together in an interactive environment that tracks overall contract changes and gives managers elemental level reporting capabilities necessary for effective decision-making. The model has four components.

Component 1: The Contract—Seat of the Change

The driver of change, the contract, is the platform for directing the entire change management process (see Figure 2). This presentation of the main contract file is designed for ease of use, ease of readability, and ease of learning. In the system, the primary determinants of change are new non-structural requirements and fund availability. The fund management functionality will be addressed later in the paper. The contract document itself is a pseudo-representation of the Uniform Contract Format (FAR, 2018) where critical performance is highlighted and focused. In this model's case, sections A, B, C, and G are primary, while the remaining sections are indirectly linked. For example, section F, deliveries or performance, and section E are connected to section B at the line item level. The purpose of this arrangement is to enable users to focus on the critical aspects of the contract's management and at the same time generate the required compliance data as the user works through the system. In other words, spend time managing procurements to achieve outcomes first rather than spending time filling paperwork for paperwork's sake. The result is a user experience that lets the system automate the mundane and free up critical attention to other areas of contract administration, all within the same infrastructure. The result is a focus on the optimal outcome while having the confidence that the system will manage compliance automatically.

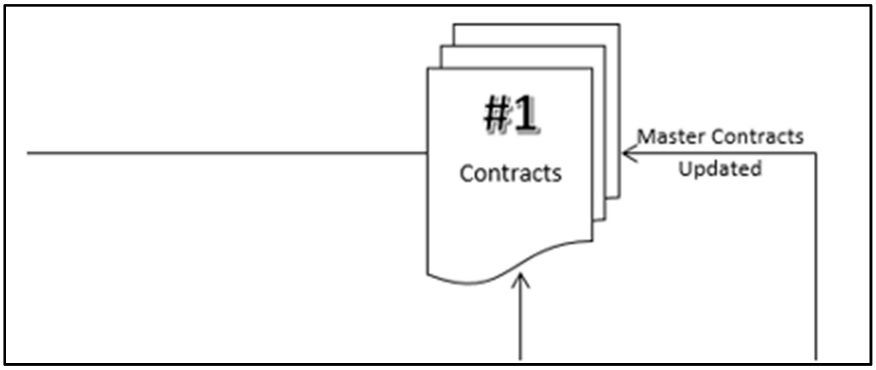

Figure 2. Contract Module of Bicycle Model

Line Item Level Management and Insight

A critical section of the contract and what the system brings to the fore is real time line item level management. From a data model perspective, the CLIN and SLIN relationships are what binds the contract together with stakeholder groups. Table 1 illustrates that data relationship.

Table 1. Data Relationship

ACRN	Number	Short Description	Cost Type	UOM	UNIT	RATE	Extend Price	Deliver/Performance Location	Contractor

Each column represents a relationship that builds the contract, binds parties together, and is subsequently affected when making contract changes. Any changes made to these data points result in a contract change that needs to be tracked, categorized, approved, consolidated, and legally modified. The overall goal of this approach is to make the contract file genuinely interactive, reportable, and friendly to end users.

Cost Type Management

In the system, cost type indicates how CLIN/SLIN pricing is determined and accounted for. Each line item has a cost type that requires the contractor(s), whether for new awards, modifications, or changes, to provide the relevant pricing information. The contracting user is presented with different template interfaces based on cost type. This allows contractors to price line items and at the same time allow government users to perform Independent Government Cost Estimates (IGCE) for each line item. The result is the ability to compare directly, line by line, the contractor's reported price and the government's estimates.

Contract Level Reporting Functionality

Key to this model is the idea of contextual, elemental, and relationally linked data. In other words, the data an authorized user can see is easy to read, understand, and comprehend. Rather than looking at aggregates, the system gives an elemental level at contract line level(s), fund expenditure level(s), vendor/contract level(s), task order/technical instruction level(s) and user level(s). To this effect, the data is organically generated as a result of utilizing the system rather than keying in data. In the model, every action during the change management process is documented, tracked, and reportable in required and ad hoc formats depending on user preference and privilege.

Component 2: The Change Management Cycle

The first construct in this model is the Master Contract File (MCF). The MCF is the simple data model representing component 1 addressed earlier. Any user attempting to create changes automatically generates a local Contract Branch visible to the user and those the user has chosen to collaborate with. The master and branch concept is the primary mechanism for organizing changes with a multitude of users against multitudes of contracts with multiple contractors.

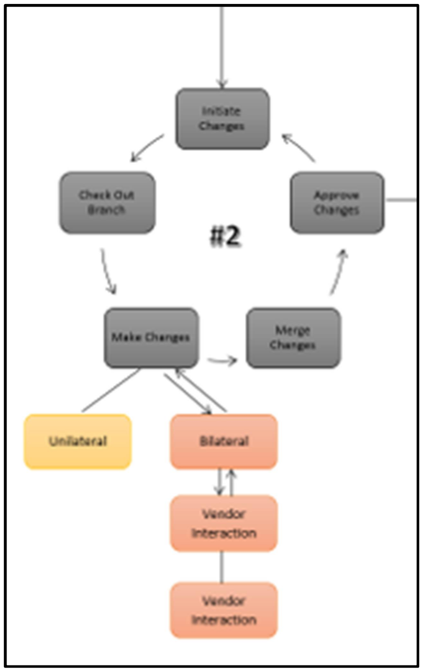

Figure 3. Change Management in Bicycle Model

This cycle involves the end-user assigned to enforcing contract performance and building change requests. This cycle has built-in workflow and is designed to receive changes continually. The sequence can handle multiple users making multiple applications for contracts.

1. A user would create a request for contract change (RCC). An RCC is a local copy of a contract, called a branch.
2. Depending on the scale of changes or collaboration, the user can invite other users to collaborate on an RCC.
3. Users then begin their work by making additions, subtractions, deletions, and other changes to line items, statement of works, fund management. They issue technical instructions/task orders and issue stop orders when applicable.
4. The system categorizes and analyzes the changes and determines each difference as either unilateral or bilateral.
5. Bilateral changes, depending on the nature of the modification, generate a need for contractor concurrency to conclude a supplemental agreement. In the event of a technical instruction or new work, a request for change is created and sent to the contractor to gather pricing and other information. The contractor sends back their response, and the data is applied to the requisite branch of the contract.

6. Once all changes are made, the initiating user then checks for duplicate or overlapping changes. Should there be overlapping or conflicting changes, the initiating user adjudicates the conflicts and merges the changes into one coherent document. Keep in mind that nothing is official until changes are approved.
7. The user then decides whether to continue allowing changes or stopping their acceptance. If the user leaves the branch open, more changes can be made and merged. If the user is ready, the changes are submitted to workflow.
8. The initiating user then sends the package of contract changes into a workflow process based on agency organizational rules and policies.
9. If the package of changes is approved, the package becomes a part of the concurrent modification. As mentioned previously, concurrent modification means one official action consisting of many changes rolled up into one universal modification. All concurrent changes can be rejected using this model.

In ending, the change cycle allows for continuous and controlled change management within a localized version of the contract. The deltas or changes are categorized and sorted by their FAR-defined types of modification. Finally, the cycle allows the user to continue making changes without a need for a pause in the process. As an aside, the next section continues the discussion on the format of the contract file.

Interactive Contract File Data Model

The goal is to transform the traditional electronic contract file, as specified by the UCF FAR 15.204-1, and treat the electronic contract file (ECF) as genuinely electronic. In other words, be a central repository for contract and award data that legally complies with the definition of an ECF that can be managed electronically. This includes the tracking of contract modifications, task instruction/orders, stop orders, funding allocations, administrative changes, protests, and close out—a "living contract" document so to speak. The contract file itself is the vehicle for direct management versus being a reference point on which to base managing the action.

The concept of a paperless contract file is not a new idea. Since 2000, the DoD has been implementing paperless contracting processes. To list a few cases, Standard Procurement System (SPS), Wide Area Work Flow, and many other systems geared toward support of a paperless environment (Sherman & Freeman, 2007).

The fundamental difference between a paperless contract file and a genuinely electronic one is the degree of interactivity between contracting stakeholders and resource owners. The second facet is the degree of use the data represents. To be clear, this is not an electronic filing system but a systematic automated method to manage changes and track them in real time—in other words, concurrent modification.

Pooling of Approved Changes

The act of pooling or aggregating approved changes serves as a controlled intersection for incoming contract changes. The point, represented as a gear, serves as the gatekeeper from changes or sub-modifications made from contract branches before they are released into the next cycle. Critical to this model is the reporting module sitting directly above the changes.

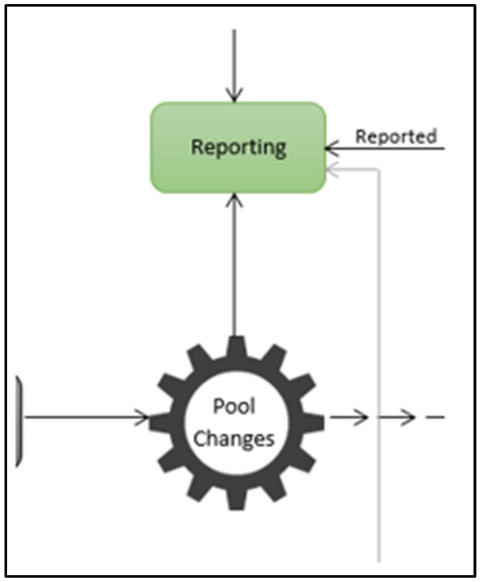

Figure 4. Change Pooling and Reporting in Bicycle Model

The reporting module is the central repository of change tracking—logging and analyzing contract deltas. Deltas, the real alphanumeric changes between the branch contract and master contract. The centrality of this reporting center allows managers and audit users to peer into the ongoing changes on any contract at any time. The reporting module will be revisited later in this paper.

A final note on this section revolves around compliance and adherence to the DATA ACT. As part of the user design, a more straightforward interface is used for the best user experience, but the back-end data model is structured with compliance in mind. The data model is represented twice—a simpler relational structure of the contract, the related changes, and the DATA ACT Compliant Extensible Markup Language (XML), and (extensible Business Reporting Language) (XBRL) based on Data Act Information Model Schema (DAIMS). The latter format option allows for seamless output to external systems for compliance while the former preserves a simpler user interface and experience.

Component 3: The Contract Conformance Cycle

The next cycle is the domain of the contracting officers, contract specialists, and resource managers (see Figure 5). The themes of this cycle are resource obligation, legal reviews, consultations, and notifications.

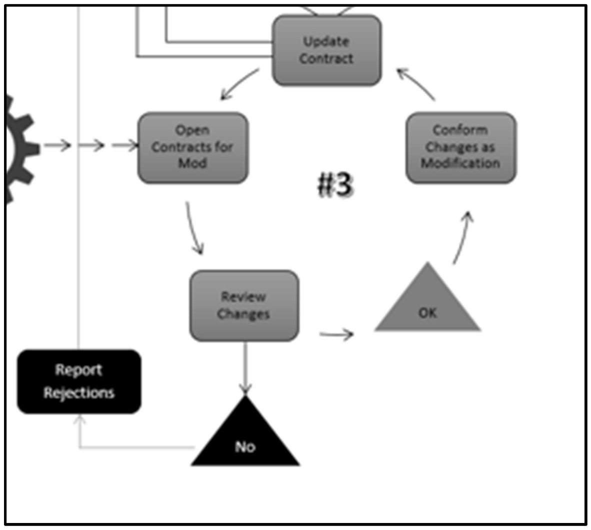

Figure 5. Contracting Conforming Process in Bicycle Model

The following section explains the process step by step.

1. A contracting officer (administrative or not) reviews contract changes incoming from the pool.
2. The contracting officer "opens" the affected contracts for legal modification and confirmation.
3. The contracting officer organizes what changes are going to be made in this modification cycle. While the contract is open for modification, transitions originating from the first cycle are allowed to pass through.
4. The contracting officer formally rejects or approves the collective batches of changes. Rejected changes are sent back to the originating user for adjustment and resubmission.
5. Once satisfied, the contracting officer "closes" the contract for modification. As a result, all incoming changes are held in the pool.
6. The contracting officer then "conforms" the changes into the master contract. The act of conforming does the following:
    a. Obligate/modify/remove funding from the affected CLINS/SLIN
    b. Textual changes in the document such as statements of work
    c. Confirms the task/technical instructions, task orders, work and work stop orders
    d. Changes the value of the CLINS/SLINS and therefore the value of the contracts
    e. Add/edit/remove contract provisions/clauses
    f. Add/remove CLINS/SLINS/ELINS
    g. Generate a "modification changelog"

    In essence, the conformation process is the application of the pooled changes into the master contract file.
7. The master contract file is updated.

The cycle is designed to handle not only changes against a single contract, but to manage changes against multiple contracts, all at the same time.

Component 4: Notifications and Reporting

The cycle now comes full circle as the originating users and contractors are notified (see Figure 6).

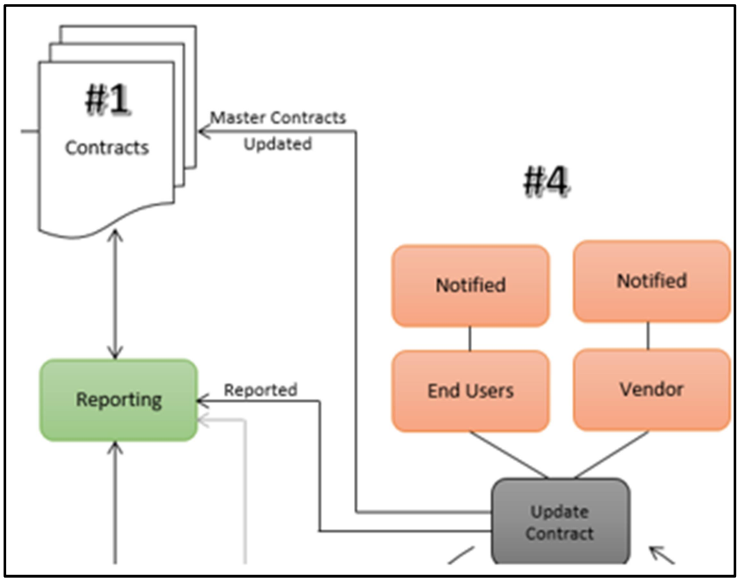

Figure 6. Notifications and Reporting in Bicycle Model

Contractors/vendor users receive several types of notifications depending on the nature of the change. In the event of a supplementary agreement, official contractor sign-offs are required by the contractor point of contact as part of the modifications process. If it's administrative and concerns the contractor, a summary of changes is sent that the contractor POC acknowledges.

End users—defined as on the ground engineers, project managers, contracting specialists, and contracting officers—are notified of the changes. Each end user who made a request receives a report of the summary of their differences that were modified and those that were not. The end user, looking at the master contract again, will see the updated contract and can initiate a new change.

Reporting Revisited

Approved changes have been conformed, and the result is exported to the reporting module. As mentioned previously, the reporting module looks at the two phases of the contract change process—the changes as they are made and the changes that were incorporated into the contract. The double entry of change allows auditors or managerial users critical insight into each contract as it changes in real time. These actions are available for review, desk audit, and official audit long after the contract is completed and closed out. Adopting this understanding Navy-wide would render Navy shipbuilding a fully auditable endeavor.

Business Logic

This section will show how each of the principled features is individually addressed. The format will be of a statement and direct answers.

1. Multiple modifications executed in parallel with numerous accounting classification reference numbers (ACRNs) targeting various Subline Item Numbers (SLINs)
    a. The change cycle, the left side, is responsible for managing all changes. Users would make their adjustments to the CLINS/SLINS and associated ACRNS as if they were editing the contract. The system analyzes and categorizes the changes and applies the relevant business logic. In the case of ACRN, where fund management comes into play, the act of adding/removing a fund cite, adding/lifting funding, or moving funds constitutes three separate changes.
    b. As explained in the previous section, the collection of changes goes through a vetting and approval process to remove duplicates and mediate conflicts. Once completed, all approved changes are pooled awaiting formal processing by the contracting officer(s) for the various contracts.
    c. Once the contract(s) are opened for conforming, the changes are sent through to the right side of the cycle.
    d. As soon as the modification has been grouped, approved, and funds appropriated, simultaneously, the package of changes are applied to the affected contracts.
2. Various Task or Technical Instructions (TI)
    a. Tis follow a similar process; however, should an instruction require pricing information, the vendor must respond. The response then must be reviewed and approved. Once approved, the task or technical instruction exists on the CLIN/SLIN structure or references a CLIN/SLIN structure.
    b. The procedure of generating Tis generates a series of indirect changes such as funding allocation.
    c. The group of changes related to a TI’s preparation is added to the more prominent catalog of changes made, which are then pooled, as mentioned earlier.
3. Multiple Contract Line Item Numbers (CLINs) dictating different contract reimbursement types, i.e., fixed fee vs. cost reimbursable vs. a combination of the two
    a. The CLIN/SLIN cost type determining reimbursements as specified in the master contract can be edited and adjusted by end users.
    b. As part of the analysis of the type of changes, the system prompts users to adjust the pricing/costs associated with the line if the type changes.
    c. These changes are made as are other bilateral edits to the change package that will be reconciled, approved, and finally submitted to the pool, ready for conforming.

d. Funding requirements are taken into consideration when making changes in value to each cost type.

4. Reconciling the previous items to determine total contract award in real time, for monitoring and managing CLIN ceilings
   a. The system determines the total obligated value of the contract via the sum of all CLINs.
   b. The system also has a total budgeted contract value that is the sum of all the fund cites associated with the contract.
   c. The contracting officer can set ceilings on the global or contract level or via the CLIN level with configurable options to prevent new work until a review, or to alert users.
   d. While ceilings can be placed at the contract level, fund site and ACRN specific ceilings can be positioned to allow flexibility based on account or appropriation. For example, setting a threshold or time limit of money for 70% and a time limit for the first fiscal year of funds.
5. Warehousing large volumes of ancillary data electronically in an easily accessible format
   a. Reporting on these changes are mission critical. As explained earlier, the data structure allows the user to investigate several avenues of the model.
      i. Transaction layer, elemental view: a user can look at task/technical instruction level or task order level on each CLIN
      ii. Funding layer, macro view: a user can look at transactions against the funding instruments associated with each CLIN/SLIN
      iii. Change layer, contract view: a user can view all the transaction, changes, and activities on the contract
      iv. Project layer, program view: a user can see all deals and their transactions associated with a project. The following section will explain projects.
   b. Most importantly, the data presented is contextual, easy to read, easy to access, and easy to comprehend.

Large Program Management and Concurrent Modifications: The Bigger Picture

The bicycle model with a single contract to manage, while capable, is limiting in potential. When the context of contract management is adapted to a more extensive program view, the bicycle model provides the ability to manage large numbers of changes. A new construct is introduced called a project.

The traditional definition of a project is temporary in that is has a defined beginning and end in time, and therefore defined scope and resources (Project Management Institute, 2018). A project, as described in this paper's context, is set as a data container for acquisition outcomes, funding, and managing users. A project can form a base unit to create the basis for the program. More importantly, the project is a container for program funding. A project is a central point for all procurement actions, from creating purchase requests, generating a request for contract change, managing contract tasks and line items, and tracking expenditures.

How does the system tie a program objective, program element line of account, contract, managing users, managing funding, and tracking changes? Projects are the answer. They exist to categorize, organize, and structure the data. The following graphical example is a simple, fictional naval maintenance program structure guide.

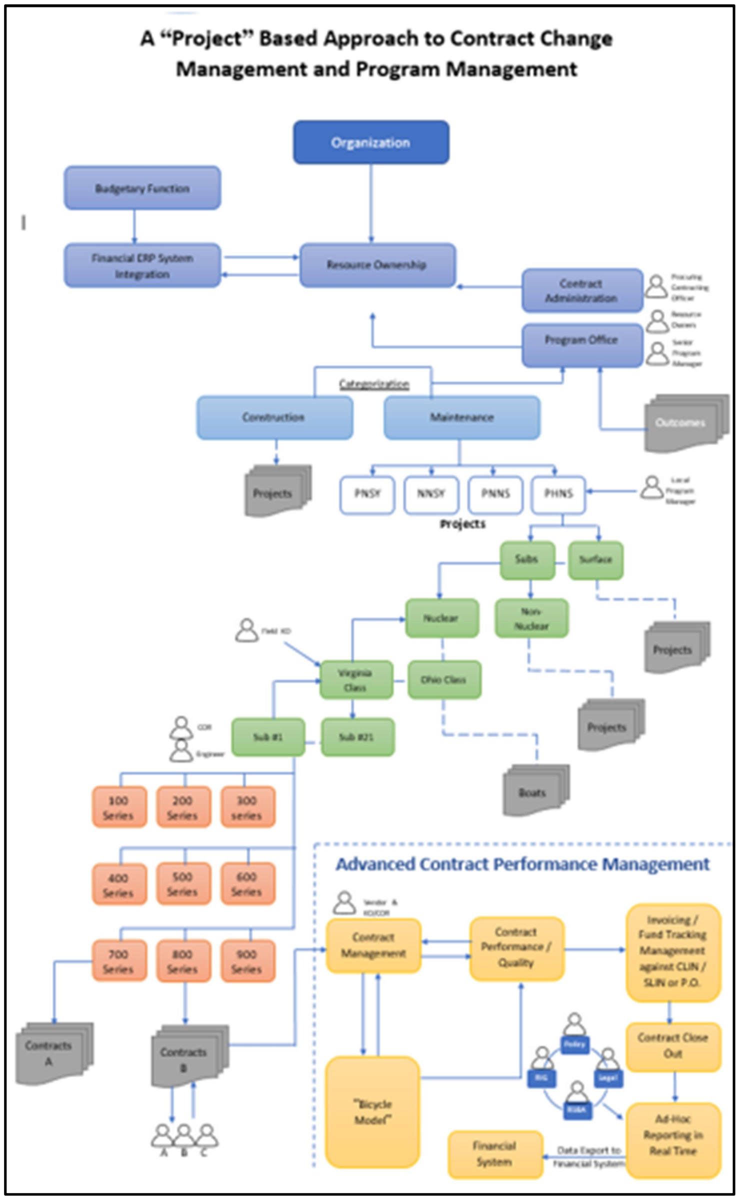

Figure 7. Project-Based Approach With the Bicycle Model Included

This example represents a complex organization with two functions: construction and maintenance. Each has funding appropriated with assigned program staff. Under the maintenance project is a child project for all activities at a particular shipyard. Under the shipyard project are projects for surface and subs, while further down is nuclear and non-nuclear. Below the nuclear class are the class of subs and finally under that, the actual sub itself. On that particular sub exists the various sections of the sub and at the root exists the various contracts supporting the serious projects. At last, the elemental level is the contract itself (see Figure 7).

By choosing the level and grouping elements, users have varying control on how many contracts can be modified at the same time, whether at the series level, the actual sub, or subclass level. The bicycle model itself is a small but important part of a larger program structure picture. This would be total visibility to support change management not only at the contract level but at the program level as well—in other words, CCM real time situational awareness.

Conclusion

This paper examines the process known as concurrent contract modification and proposes a solution to automate it. While CCMs are not inherently disallowed, they do present a significant contract logistical and administrative problem resulting in challenging outcomes. The larger projects become, the more difficult it is to track, administer, and document proposed changes and their impact on planning, cost, program management, and delivery. Without an efficient means toward managing incoming changes, gaining any tangible and accurate reporting on project outcomes proves significantly challenging, if not impossible.

This paper proposes a new approach to contract change management, utilizing a software tool designed for ground-level operations that scale up to contract and program responsible stakeholders. Instead of relying on the output of contract writing systems, this system should be used to manage the execution of the many related contracts under a single project with shared sources of funding. Focusing and bringing an automated infrastructure and a process for contract change management will allow for greater insight and accountability at program execution levels. In the case of the Navy, at the Regional Maintenance Center or shipyard level.

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