



## The “Projectness” of MOC

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### **Abstract**

The safety community, bolstered by the PSM regulations, has emphasized the importance of proper management of change, “MOC”, to ensure safe, reliable and economic operation of chemical plants, refineries and increasingly, on- and off-shore pipelines and installations.

The majority of MOCs involve physical changes to facilities—a much smaller fraction of MOCs addresses procedure-only changes, document-only changes or organizational changes. Physical changes to facilities are implemented in different contexts such as maintenance work orders, project work orders, small capital projects and large capital projects. Each of these contexts has its own notion of a “work process”, and the larger ones are very project-centric.

Changes to facilities always involve BOTH an MOC and a “work process”. Some sites emphasize the work process aspects, driven by the existence of Enterprise Resources Planning systems, and handle the MOC essential elements poorly. Other sites burden the MOC process with many capital-projects aspects and create a very complex change management environment. Surely there must be a happy medium?

This paper analyzes data from case studies from actual implementation projects, identifies gaps and makes recommendations on the best practice for conjoining MOC and other work processes.

## 1 Introduction

So, you've got a capital project... Do you need an MOC?

So, you've got an MOC... How do you get the money approved?

The remainder of the paper will attempt to provide comprehensive answers to these questions.

## 2 Regulatory Perspective

To answer the first question, “do we even need an MOC”, in the capital project context, let's review what the applicable section of the OSHA Process Safety Management regulation [1].

The OSHA definition of what constitutes a change is:

(l) *Management of change.*

(1) *The employer shall establish and implement written procedures to manage changes (except for “replacements in kind”) to*

- *process chemicals,*
- *technology,*
- *equipment, and*
- *procedures; and,*
- *changes to facilities that affect a covered process.*

Shortly after the PSM regulations were promulgated, Ms. Susan Tolley acting on behalf of Chevron, asked OSHA for an interpretation about when a project is large enough to be considered “new construction” and therefore exempt from the MOC requirements. She writes:

“How can we determine the point where changes to an existing facility have become so extensive that it should be considered a ‘new’ facility? We find the PSM standard to be very clear in the definition of ‘replacement in kind’ and how to determine the point when a facility is considered ‘modified’, but less clear on the issue of when changes have progressed beyond ‘modification’.”

The question presents a “bottom-up” perspective: we start with a small change (MOC required), and imagine increasingly larger changes until we reach the point of “new facility” (no MOC required).

The OSHA response [2], in contrast, provides a “top-down” perspective. Here it is:

“Please note under paragraph 1910.119(b), ‘Definitions’ that a ‘facility’ means buildings, containers and equipment which contain a process. A facility

constructed on a work site **where there are no other facilities** is considered a new facility...A facility, subsequently constructed on the work site such that it is physically separated from and otherwise independent from existing facilities, is considered a new facility. (A facility is considered independent when the facility including the process(es) contained in the facility would not affect or be affected by an existing facility including the process(es) it contains. Otherwise the facility is considered a dependent facility.) ...**A facility, subsequently constructed on the work site such that the facility or the process(es) it contains is connected to or otherwise dependent on an existing facility including the process(es) it contains, is considered collectively to be a modified facility.**”

The first highlighted text indicates that construction on a green-field site, “where there are no other facilities”, is a new facility, and therefore exempt from MOC requirements.

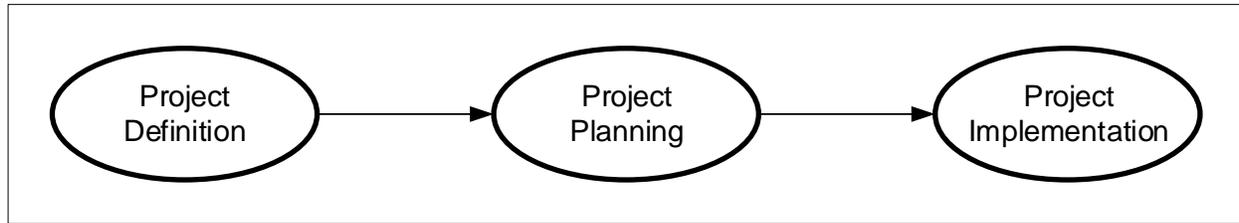
The last sentence states that any construction that is “connected” or “dependent on” an existing part of the plant is indeed a modified facility. There is a common belief that a new unit that gets all of its feedstock from tanks, and discharges all its product to tanks is therefore not dependent on other units. However, since the first sentence in the quote “‘facility’ means buildings, containers...” identifies containers, i.e. tanks, as being facilities, it’s hard to imagine a scenario where an expansion at an existing site would not be dependent on or connected to the existing facility. In other words, every plant expansion, no matter how large and no matter how new, is subject to MOC.

### **3 Large Projects**

Capital projects ranging from \$1 million to \$1 billion are not uncommon. The use of the word “capital” is really just an accounting designation. The important attribute of these projects, from a business process standpoint, is that they are large, so they will henceforth be identified as “large projects”.

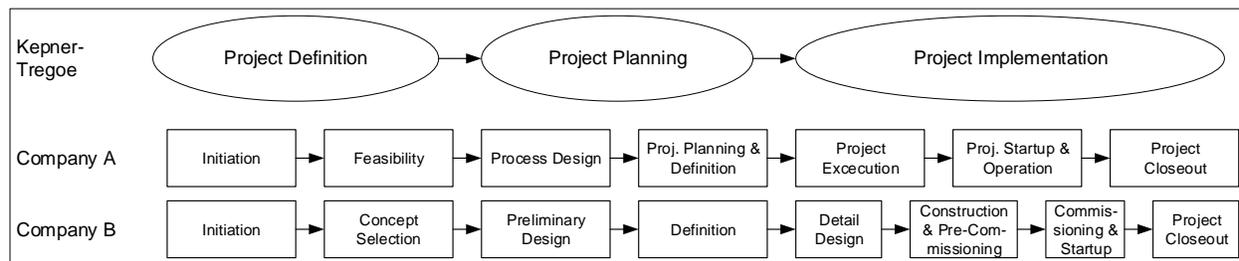
A great deal has been written about how to effectively manage large projects. The Project Management Institute (“PMI”) is a professional organization and advocacy group for project management that has many resources available on its website: [www.pmi.org](http://www.pmi.org), and promotes the notion of a “Project Management Body of Knowledge” [3]. Ref. [3] begins with a generic three-phase model: “Initial”, “Intermediate” and “Final”.

Another resource in this domain is Kepner Tregoe, Inc. (“KT”) which provides consulting services and training in project management. Like PMI, the Kepner-Tregoe model [4] represents a project in three large phases, as shown in Figure 1.



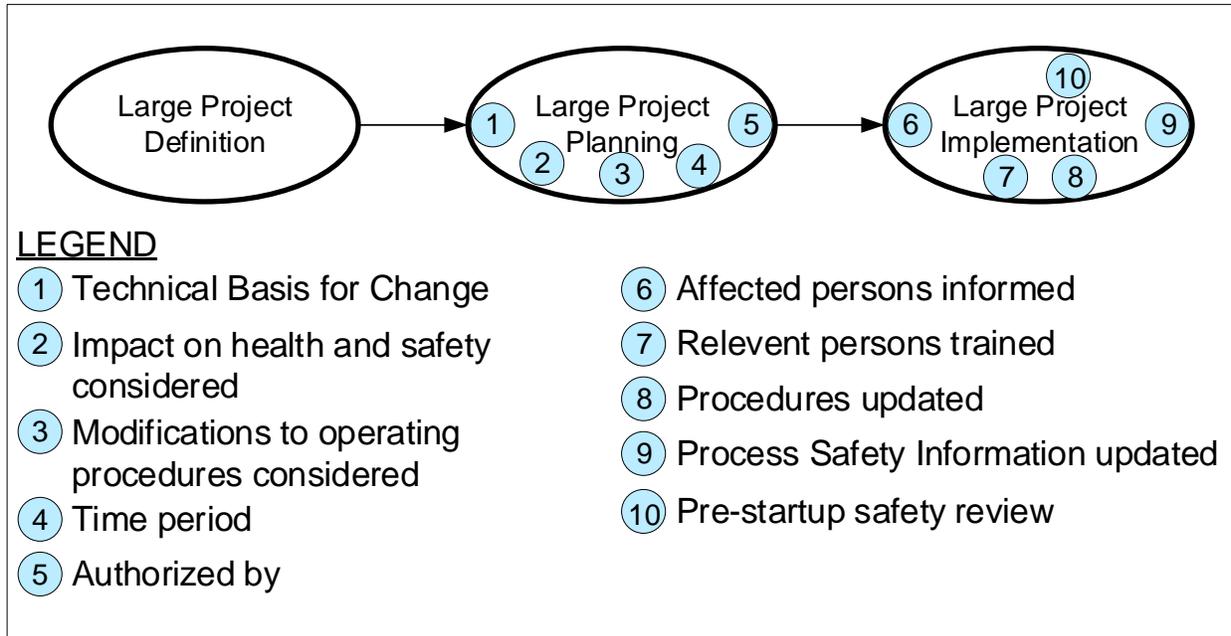
**Figure 1. The three-phases in the Kepner-Tregoe project model.**

Most large organizations understand the need for a systematic project process, and have taken the KT or similar model and adapted it for local usage. Figure 2 shows how Company A has decomposed the three phases of the KT model into 7 lifecycle states for large project; Company B uses 8 states to achieve the same goals. Note also that, while “Initiation” and “Close-out” are widely accepted as the names for start and finish, the intermediate state names are different, even though the work is similar.



**Figure 2. Adaptations of the KT model by various companies.**

Within each state—Initiation, Feasibility, Process Design, etc.—there are a large number of action items, certainly dozens of action items per state, but often numbering into the hundreds. Some of the action items are quite familiar:



**Figure 3. Action items commonly encountered in a large project, for a covered process.**

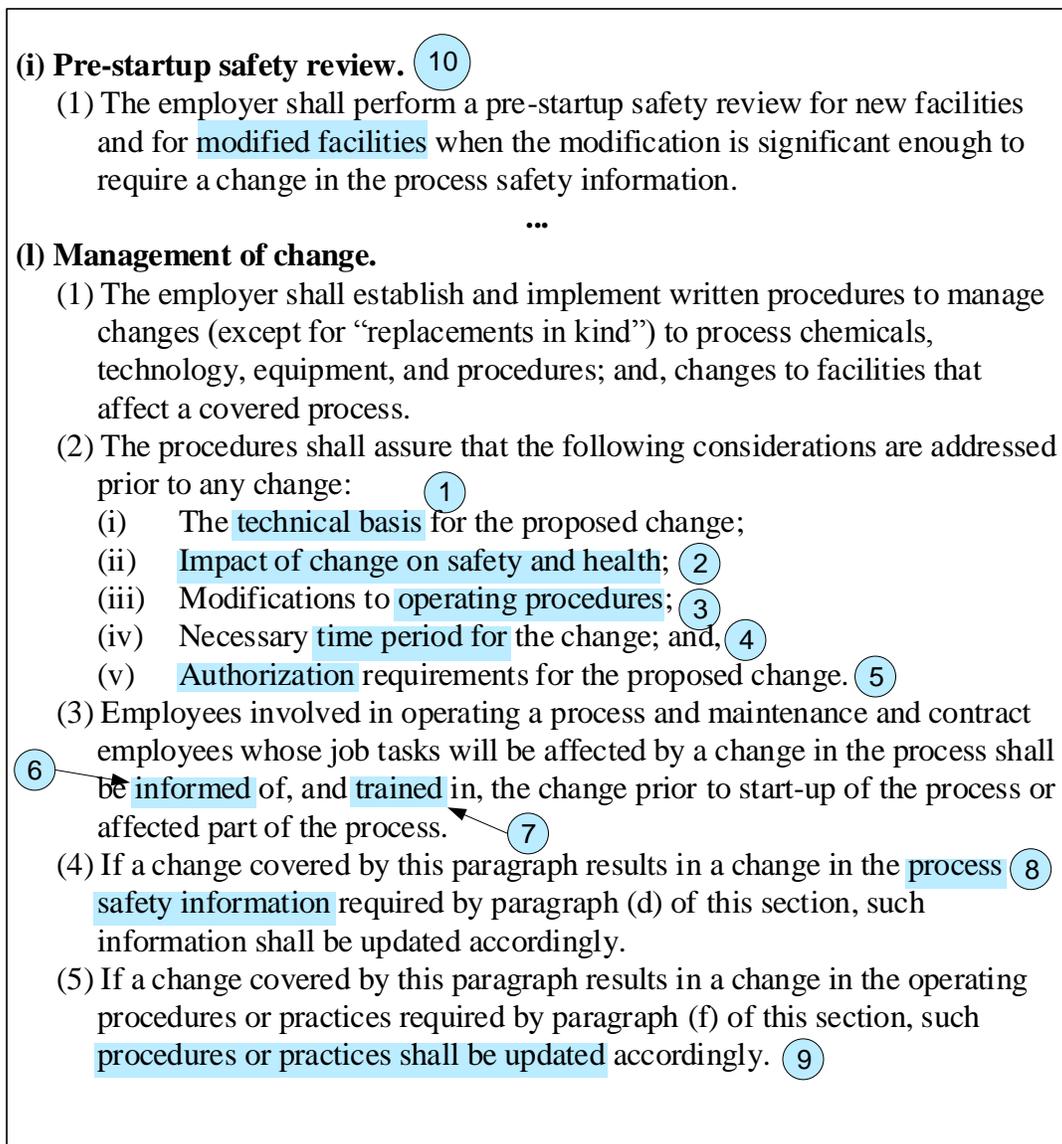
Since the project has numerous states, and hundreds of action items, the methodology provides formality and discipline, but adds a not-insignificant overhead. This is a “heavyweight” business process, and lends itself to multi-million-dollar projects. What about \$1 million projects? Or, \$100k projects? At what point is a project small enough that the overhead of a formal project methodology is no longer warranted or cost effective?

Enter the MOC...

#### 4 Management of Change

Since the promulgation of the OSHA Process Safety Management regulation in 1992 [1], MOC has matured considerably.

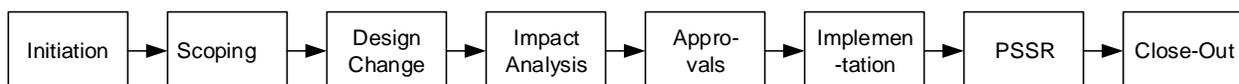
Figure 4 shows exactly what the regulatory requirements for an MOC are:



**Figure 4. MOC essential requirements.**

(Note that the first MOC requirement is actually stated in the section on pre-startup safety reviews.)

In order to ensure that all the requirements are met, MOC also has a formal business process. Permanent MOCs might follow the lifecycle shown in Figure 5. Similar processes exist for temporary MOCs, Emergency MOCs, etc.



**Figure 5. Permanent MOC lifecycle.**

MOCs may begin small, but with the capability of executing checklists (“Scoping” state), generating and addressing PHA follow-up items (“Impact Analysis” state), triggering training (“Implementation” state), generating and addressing PSSR punchlist items (“PSSR” state), means that MOC is also a heavyweight business process.

## 5 The Relationship between Large Projects and MOCs

### 5.1 Tracking MOCs

There is a striking similarity between certain large project action items in Figure 3 and the essential requirements for MOC shown in Figure 4. In the section on “Regulatory Requirements”, it was shown that “every plant expansion, no matter how large and no matter how new, is subject to MOC”. Now it appears that both the large project business process and the MOC business process attempt to trigger the same action items. If there is to be an MOC for each large project, then how would one prevent the duplication of effort implied by these requirements? Moreover, since most companies use electronic systems to manage MOC, the electronic systems force the execution of all the steps in the MOC, whether there’s a large project or not.

We propose the creation of a new kind of MOC: the “Tracking MOC”, depicted in Figure 6, with the features identified in Table 1.

On a typical MOC, the MOC process is active:

- Creates the action item: e.g. “Redline the P&ID”, “Update the electrical schematic”. Note that these action items are phrased in the form of imperatives: “Redline...”, “Update...”
- Assigns the action items to a person or group of people
- Assigns a due date for the action item(s)
- Provides tools to aid in conducting the action items: e.g. checklists, data collection forms, links to document storage locations,

But, in a large project context, each of these action items is driven by the large project process. So, the purpose of the Tracking MOC is simply to ensure that the action items were completed, even though the completion of the action items, and the supporting evidence or documentation, is all in the large project environment. On a large project, the Tracking MOC is passive<sup>1</sup>:

- The Tracking MOC asks, “Confirm that the technical basis of change was documented”

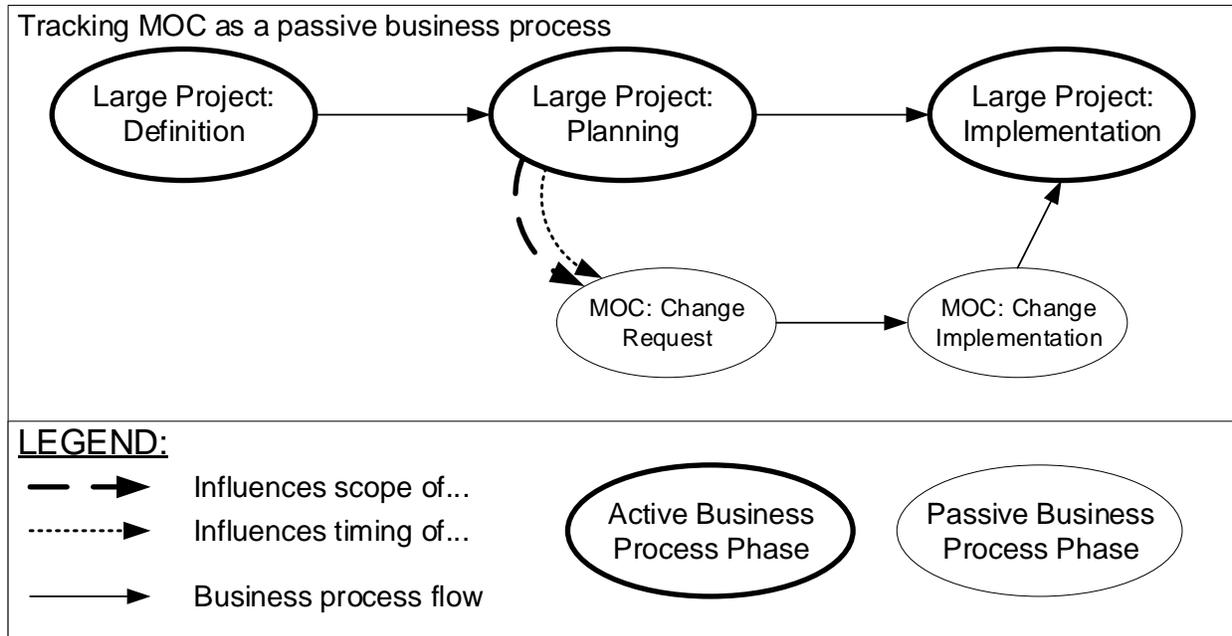
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<sup>1</sup> “Active” and “passive”, as used in this paper, denote initiators of actions (active) vs responses to those initiations (passive). The words “active” and “passive” do not correspond to their usage in grammar: e.g. the “active voice” vs the “passive voice”.

- The Tracking MOC asks, “Confirm that the PHA was completed”
- Etc.

**Table 1. Comparison of Typical MOC with Tracking MOC conducted in the context of a large project.**

Req't No.	Action Item/MOC Requirement	Typical MOC	Large Project Context	
			Large Project Process	Tracking MOC
1	Develop technical basis of change, i.e. design data	●	●	○
2	Determine impact on health and safety, i.e. PHA; address PHA follow-up items	●	●	○
3	Draft modifications to operating procedures	●	●	○
4	Identify time period, e.g. temporary change start and finish	●	●	○
5	Obtain authorizations	●	●	○
6	Inform affected persons	●	●	○
7	Train relevant persons	●	●	○
8	Update procedures	●	●	○
9	Update process safety information	●	●	○
10	Conduct pre-startup safety reviews, address punchlist items	●	●	○
LEGEND: ● Active Process ○ Passive Process				



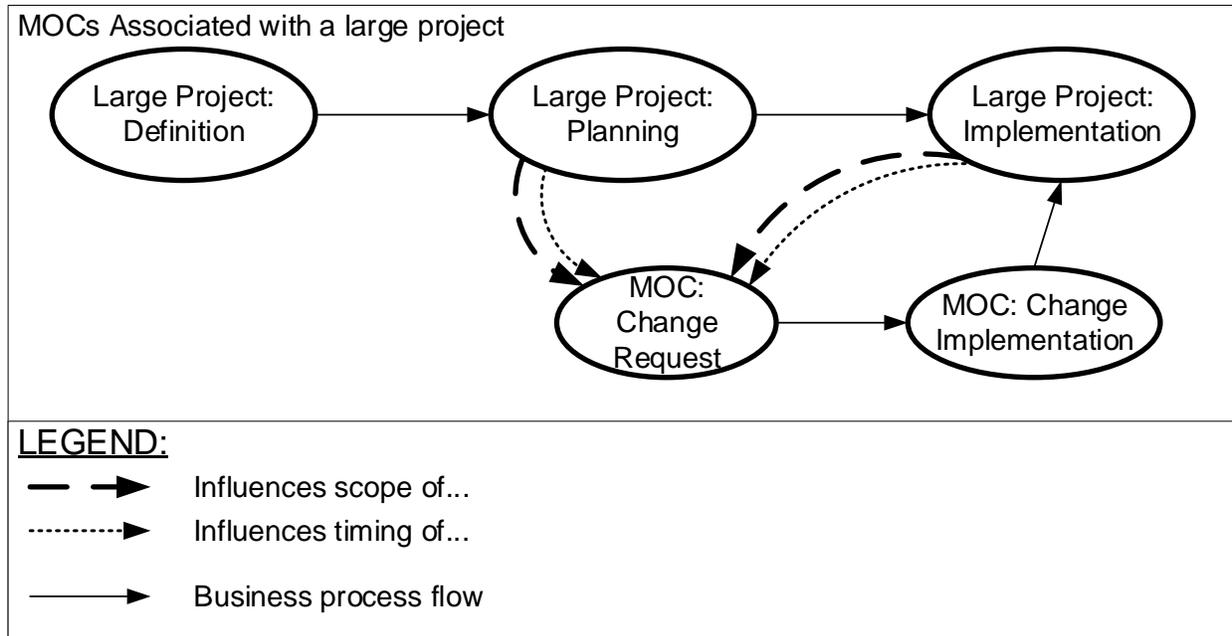
**Figure 6. Tracking MOCs are passive.**

## 5.2 Associated MOCs

As a large project proceeds, it becomes clear that additional MOCs are needed. Examples includes:

- Permanent MOCs:
  - To address interconnection to existing facilities
- Temporary MOCs:
  - To address temporary alarm bypasses,

Associated MOCs are complete MOCs: they have detailed scoped, design documentation, hazard analysis, and approvals. The timing of the implementation of the MOCs must obviously be coordinated with the large project with which they are associated.



**Figure 7. MOCs associated with a large project.**

## 6 The Relationship between Small Projects and MOCs

In the previous discussion we saw that, generally speaking, for large projects:

- The WORK of the change is driven by the active process: the large projects process,
- MOC is a passive process, and entirely dependent on the large project.

Is the same thing true for small projects, say, in the < \$100,000 range?

Practically speaking: “no”.

In theory, small projects should be treated like large projects, and the relationship between small projects and MOC should be the same as the relationship between large projects and MOC, but that is not observed in practice.

In order for the relationship between small projects and MOC to be same as the relationship between large projects and MOC, there would have to be a similarly robust small-projects process. That’s not generally found in practice. Instead what we discover is:

- Consolidation into MOC
- After-the-fact MOCs

**Consolidation into MOC:** Company policy states that “all projects should follow the same process”. However, the large project process introduces formality, reporting, etc. which is

perceived to be excessively burdensome for small projects. So, the “large” project methodology is simply ignored for small projects, or just performed in a perfunctory manner.

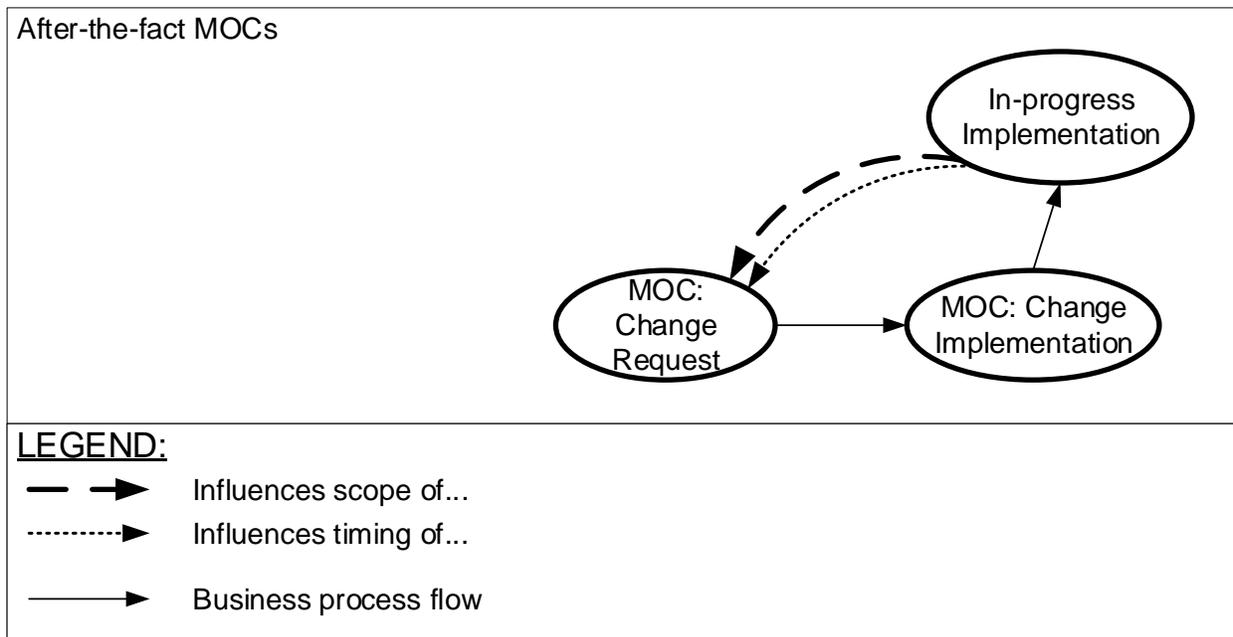
Also, a company may have a separate process for small projects. However, audits conducted by the author have revealed that small-project processes are less well understood, than large project projects, and less well promoted. The result is that that these processes fall into disuse.

Instead, staff discover that the MOC process offers (almost) all the capabilities required for successful project management:

- a systematic, robust process
- configurability through the use of checklists
- coverage of all process safety requirements

Given the robustness of the MOC process, there is little need for a separate small-projects process. If the MOC process becomes the “carrier” for small projects, then the small project process has indeed been consolidated into the MOC process.

**After-the-fact MOCs:** An after-the-fact MOC occurs during implementation of work in the facility, when there is a sudden realization that the work-in-progress is indeed a change and requires an MOC. The most common example is when a work order is being executed on a small project. This triggers a rushed MOC whereby MOC scoping is rushed, redlines are rushed, PHAs are rushed and approvals are rushed. Clearly, this situation is to be avoided.



**Figure 8. After-the-fact MOCs**

In an environment, with a mature MOC system and a disciplined approach to process safety, it's still possible to have this situation occur, albeit rarely. The bigger danger is those environments where MOCs are triggered by the work order system. In this arrangement, every MOC is an after-the-fact MOC, meaning that every MOC is likely to be poorly executed. Companies without an established, disciplined approach to process safety/MOC are at greatest risk here.

## ***6.2 Incorporation of Financial Approvals into MOC***

The premise behind the “Consolidation into MOC” approach, described in the previous section, is that having a separate small-projects process (analogous to large projects) is burdensome, and that the same objectives can be achieved by consolidating the project management aspects (scoping, document updates, hazard analysis, approvals, implementation, PSSR, etc.) of a small project into the MOC process. This is in common usage, and quite successful.

Note that this only addresses:

- process safety requirements
- project execution requirements

This approach does not address financial approvals. Fortunately, the number of steps to obtain financial approval for a small project is fewer than for a large project. Just as the technical aspects of the small projects were consolidated into the MOC process, it's possible to consolidate the approval aspects into the MOC as well, as shown in the Venn diagram in Figure 9.

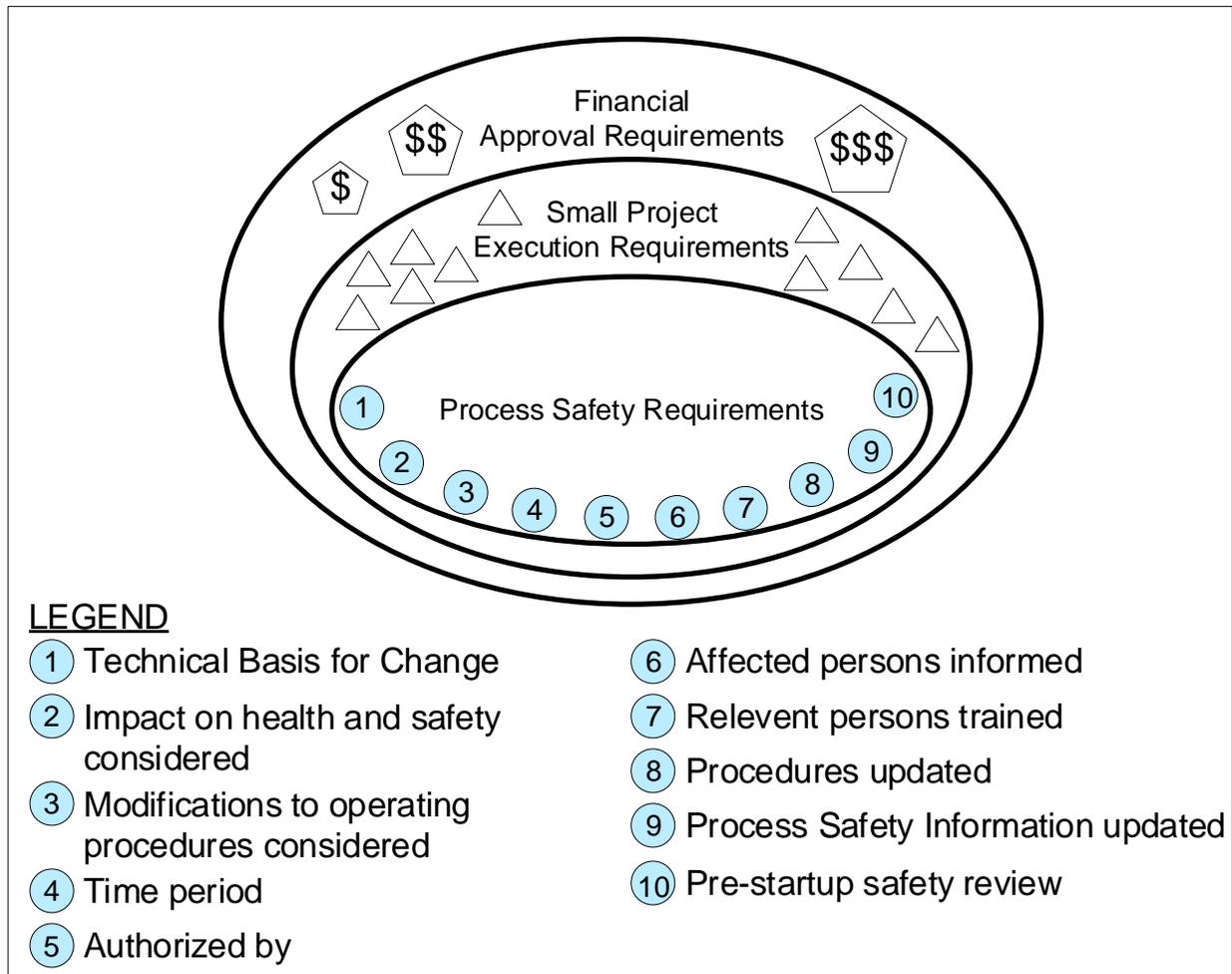
Sites proposing to pursue this kind of overloaded MOC process should consider the pros and cons, including:

- Pros:
  - A single process handles all aspects of an MOC: process safety requirements, project execution requirements and financial approval requirements.
  - This eliminates duplication of effort and is the most efficient.
- Cons:
  - The project execution and financial approval are interdependent.
  - Waiting for financial approval may delay or stop the project execution progress, and vice versa.

Since most sites use electronic MOC systems, it is necessary to ensure that the MOC system is sufficiently flexible<sup>2</sup> to permit the consolidation of all of these requirements into a single, efficient, comprehensive process.

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<sup>2</sup> “flexibility”, as used here, is really “configurability”. The MOC system must be sufficiently configurable so that the panoply of needs—permanent change, temporary change, organizational structure change, personnel change, capital projects, and importantly changes with additional requirements such as financial approval—can be seamlessly accommodate.



**Figure 9. Comprehensive MOC process integrated with small project execution and financial approval.**

## 7 Summary

The OSHA perspective is that a capital project on a site where there are existing facilities, no matter how large, requires that a Management of Change procedure be followed.

A large project (dropping the word “capital” since that’s an accounting designation) is conducted with a formal multi-step methodology, which addresses process safety and project execution requirements. An MOC is also conducted with a formal multi-step methodology, which addresses process safety requirements, so there is an overlap between these two concurrent, mandatory processes. This paper proposes the use of a “Tracking MOC”, whereby the execution of the project is driven by the large project methodology, and the Tracking MOC simply ensures that process safety requirements are completed.

Small projects are not managed with the same level of formality as large projects. In fact, most companies consolidate the project execution requirements for small projects, into the MOC process. This is a disciplined and efficient approach.

This model can be extended by consolidating the financial approval requirements, with the project execution requirements, into the MOC process. This assumes that the technology supporting the MOC process is flexible enough to accommodate the consolidation of the three business processes into a single comprehensive process.

## 8 References

- [1] OSHA, *Process safety management of highly hazardous chemicals*, Washington: OSHA, 1992.
- [2] OSHA, *OSHA Standard Interpretation, 01/11/1996--Process safety management at what point a work site change would no longer be considered a modification but a new facility*, Washington: OSHA, 1996.
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- [4] A. a. M. J. Longman, *The Rational Project Manager*, New Jersey: John Wiley & Sons., 2005.