

How to avoid scheduling games played by contractors in construction projects^{1, 2}

Lisa Di Cosmo

ABSTRACT

Construction projects can face many scheduling games played between contractors and owners. These games will impact the project in many different ways. Longer costs and longer delays are two examples of negative effects of the games. This shows the importance of agreeing with the right terms and the right clauses during the pre-project.

Therefore, the main purpose of this paper is to identify the different games that can be played in order to provide different solutions to the owners. Then, the owners will be able to protect themselves.

As many games can be played with the schedule, a lot of attention has to be given to the clauses and specifications on the contract.

Key words: Construction management, construction project, games, schedule, delay analysis, project delivery, time, damages, owner, contractor

INTRODUCTION

The construction industry is a booming and wide industry. It is one of the industries which has a high impact on the economy of countries. In fact, construction embraces several social and commercial sectors, and embraces lots of different actors from different sectors: suppliers, construction workers, engineers, designers, and many others.

Nonetheless, construction is also a complex industry. In fact, construction project management has a lot of components as planning, scheduling, project control, cost estimating, quality management, safety management, and many others. However, in construction projects, scheduling is considered as one of the most important components in order to achieve a

¹ Editor's note: This paper was prepared for the course "International Contract Management" facilitated by Dr Paul D. Giammalvo of PT Mitratata Citragraha, Jakarta, Indonesia as an Adjunct Professor under contract to SKEMA Business School for the program Master of Science in Project and Programme Management and Business Development. <http://www.skema.edu/programmes/masters-of-science>. For more information on this global program (Lille and Paris in France; Belo Horizonte in Brazil), contact Dr Paul Gardiner, Global Programme Director, at paul.gardiner@skema.edu.

² How to cite this paper: Di Cosmo, L. (2019). How to avoid scheduling games played by contractors in construction projects, *PM World Journal*, Vol. VIII, Issue IX, October.

successful project, even if all components are interdependent and that the complete success of a project depends in reaching all criteria. Indeed, according to The Department of Cooperative Governance and Traditional Affairs, “Project scheduling is one of the critical management tasks as it dictates the time frames in which the project will be completed”.³ Scheduling, according to the Guild, is defined to be “Assigning an appropriate number of workers to the jobs during each day of work, determining when an activity should start or end, depending on its: duration, predecessor activity (or activities), predecessor relationships, resource availability, and target completion date of the project. »⁴

But why is scheduling so important and why exactly do we need to schedule in construction projects? There are several reasons. First of all, as the schedule helps monitoring progress, it is a management tool. The schedule is also an implementation tool because it gives deadlines and provides a framework to employees in order to get the work completed.⁵ Moreover, schedule is closely linked to cost control. Indeed, the schedule makes it possible to organize the good allocation of resources in order to optimize it. For example, if you planned at the right moment that you will need to purchase some raw materials for a moment X, you will be able to order it at the right time. If you didn't plan that you needed raw materials for this moment X, you will have to order it in a hurry and a lot of money will be involved. Scheduling definitely makes a good organization possible. This will enable good control of money and lots of cost savings. Finally, a good scheduling process allows another major thing: managing changes. In fact, project changes will be unavoidable through the whole project. A good schedule will allow Project Manager to correctly evaluate the risks of changes (cost, time..).

Schedule is created in order to improve organization in construction projects and to avoid delays. But delays will always happen, and delays will involve change, which will “often result in additional claims for the “cumulative impact”, meaning that the damages or losses incurred by the contractor due to “delay and disruption” are more than just the sum of the value of the change orders, but an additional sum to cover the hidden inefficiencies »⁶. This is why we use schedule in order to be able to forecast results. Identifying the Critical Path using the Critical Path Method (CPM) will allow each project to determine “activities that cannot be delayed without

³ Planning and Scheduling. Cooperative Governance Traditional Affairs. Retrieved from <http://www.cogta.gov.za/mig/toolkit/TOOLBOX/PM/Planning%20and%20Scheduling.pdf>

⁴ GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (s.d.). Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-planning-and-scheduling>

⁵ The Purpose of the Project Schedule | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (2009). Retrieved from <http://www.planningplanet.com/wiki/422495/purpose-project-schedule>

⁶ (“GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet)”, s.d.)

delaying the end date of the project schedule”⁷. According to Stumpf, a delay is “an act or event that extends the time required to perform tasks under a contract. It usually shows up as additional days of work or as the delayed start of an activity (...)”⁸ However, delays in project delivery are a common problem and are found in the everyday life of projects.⁹ Four types of delays exist. (Figure 1)

Types of delays	Non-excusable	Excusable non-compensable	Excusable compensable	Concurrent delays
Who caused the delay?	Contractor	Not foreseeable event	Owner	Owner or contractor
Whose responsibility?	Contractor	Contractor + Owner	Owner	Difficult to analyze

Figure 1: Different types of delays¹⁰

If some delays are unpredictable and can’t be avoided, some delays are predictable. And some delays are created on purpose. In fact, unfortunately, contractors may use the schedule against the owner. Or in the other side, owners can manipulate schedules too. Indeed, according to the Guild, “too often the schedule becomes either an offensive or defensive tool, used to either perfect claims by one party against the other as the basis to defend against those claims. »¹¹ In fact, owners and contractors tend to disagree about schedule. Actually, this disagreement happens very often. Some contractors will create delays by manipulating schedule: this will work in their favor. This problem arises particularly in construction projects. Contractors will play with the schedule in order to win against the owner. Let’s explain that. Some contractors won’t use the schedule as a management tool. They will use it only because they have to, because the owner requires it. The owner will need the schedule because it is a way to check and monitor project progress: without a schedule, the owner will have difficulties in controlling what’s going on. This is why James G. Zack defines this tool used beyond the scenes: the Ghost Schedules. A Ghost Schedule is “a schedule other than the current project schedule. It is, typically, a schedule

⁷ GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (s.d.). Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-planning-and-scheduling>

⁸ Stumpf, G. R. (2000). Schedule delay analysis. *Cost Engineering*, 42(7), 32-43. Retrieved from <https://search.proquest.com/docview/220446193?accountid=42874>

⁹ Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*, 24(4), 349-357. doi:10.1016/j.ijproman.2005.11.010

¹⁰ The Purpose of the Project Schedule | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (2009). Retrieved from <http://www.planningplanet.com/wiki/422495/purpose-project-schedule>

¹¹ GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (s.d.). Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-planning-and-scheduling>

kept by one of the parties to the contract and results from the perceived or desired need to have a more reliable schedule. »¹² This Ghost Schedule will help the owner, while contractors may play games in their back. These games may generate several negative effects for the project, for the owner and for subcontractors. In fact, delays can lead to project delivery overrun, cost overrun and disputes & claims.¹³ The triple constraint of a project (time, cost, quality) will consequently be affected. And most of all, “manipulation of project schedules by owners and contractors damages trust and diverts attention away from the real issues on a project”.¹⁴ In order to avoid these problems, it is important to understand why contractors play games.

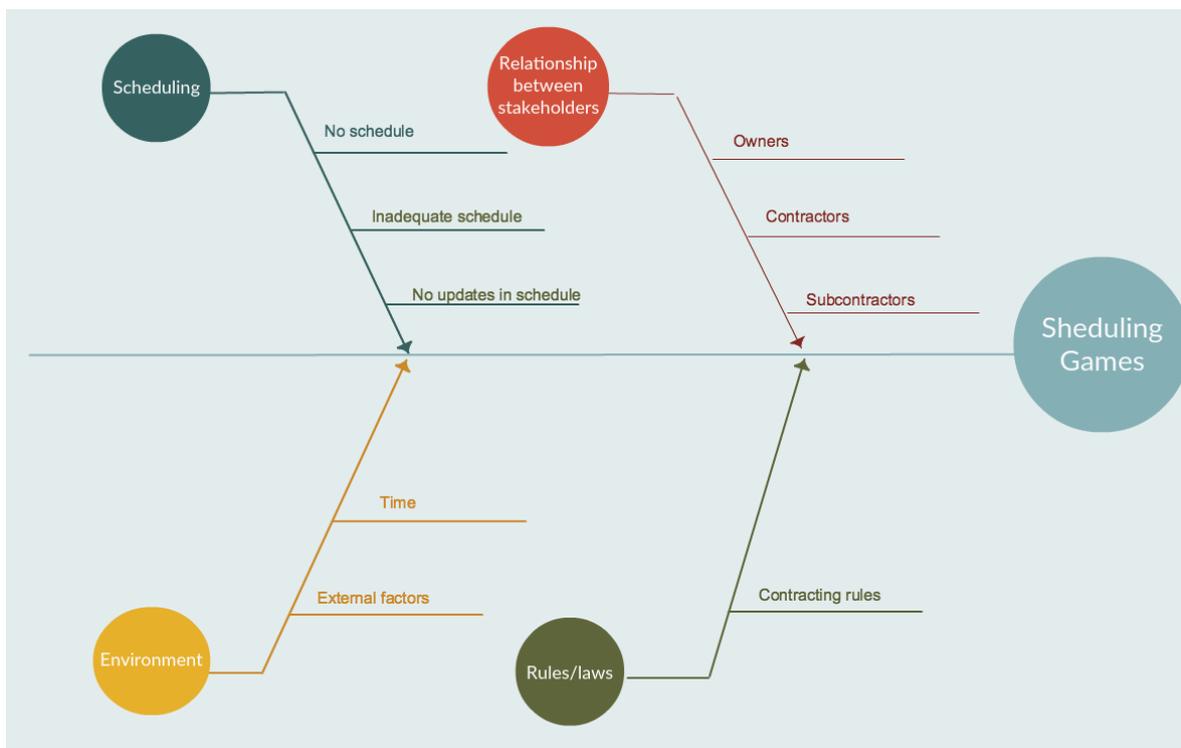


Figure 2: Fishbone by author

So how should owners proceed? Not requiring a schedule is much more risky than requiring one.¹⁵ In a world where construction projects are everyday more present, how can relations

¹² James G. Zack, Jr. (2015) Ghost Schedules – What, why & what’s the risk? Navigant Construction Forum.

¹³ Effects of Construction Projects Schedule Overruns: A Case of the Gauteng Province, South Africa. (n.d.). Retrieved from <https://www.sciencedirect.com/science/article/pii/S2351978915009907>

¹⁴ How firms can avoid the construction schedule float game. Allen Chilmeran (July 26, 2017) retrieved from <https://www.enr.com/articles/42405-how-firms-can-avoid-the-construction-schedule-float-game>

¹⁵ Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from

between contractors and owners be improved in order to avoid these games and their negatives effects? Our aim will be to provide an explanation of the different games that contractors play and find solutions that owners can apply in order to avoid these games. We will try to find a way to create a win-win solution between the two parties.

METHODOLOGY

STEP 1: Problem recognition, definition and evaluation

The aim of this paper is to provide specific suggestions (“actionable items”) that can be taken by owners to avoid scheduling games between contractors and owners in Construction Projects.

Here are the problems we are trying to solve:

- Understand the different games contractors play
- Find solutions in order to avoid these scheduling games

STEP 2: Identify the feasible alternatives

We will first try to understand and explain the major games contractor play in order to identify alternatives. This paper that I will use as reference¹⁶ identifies 19 common games that can be played with the schedule of construction projects, and their suggested solutions.

Game 1: Failure to Provide a Construction Schedule

Defense 1.1: Detailed Scheduling Specification

Author Analysis and Recommendations Defense 1.1:

According to this Model Scheduling Specification¹⁷, the owner should include a specification in the contract with the contractor. This specification should include the following clauses:

<https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>

¹⁶ Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>

¹⁷ Model Scheduling Specification Retrieved from https://ftp.dot.state.tx.us/pub/txdot-info/ta/ih635/addendum11/5_reference_information_documents/11%20-%20studies%20and%20reports/technical%20resources/primavera%20model%20schedule%20specification.pdf

- a) Definition of the scheduling terms of the contract
- b) Administrative requirements with the general requirements and the exact required schedules
- c) Technical requirements including software compatibility requirements, schedule requirements and schedule submission requirements

The author recommends that the specification requires that schedules submitted by the contractor to the owner meet the requirements defined by the US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules” <https://www.gao.gov/assets/690/687052.pdf>. More specifically, Appendix II- An Auditor’s Key Questions and Documents.

Table 2: The Four Characteristics of a Reliable Schedule

Schedule characteristic	Schedule best practice
<p>Comprehensive, reflecting</p> <ul style="list-style-type: none"> • all activities as defined in the project’s WBS • the labor, materials, and overhead needed to do the work and whether those resources will be available when needed • how long each activity will take, allowing for discrete progress measurement with specific start and finish dates 	<p>1 Capturing all activities</p> <p>3 Assigning Resources to all activities</p> <p>4 Establishing the durations of all activities</p>
<p>Well constructed, with</p> <ul style="list-style-type: none"> • all activities logically sequenced with predecessor and successor logic • limited amounts of unusual or complicated logic techniques that are justified in the schedule documentation. • a critical path that determines which activities drive the project’s earliest completion date • total float that accurately determines the schedule’s flexibility 	<p>2 Sequencing all activities</p> <p>6 Confirming that the critical path is valid</p> <p>7 Ensuring reasonable total float</p>
<p>Credible, reflecting</p> <ul style="list-style-type: none"> • the order of events necessary to achieve aggregated products or outcomes • varying levels of activities, supporting activities, and subtasks • key dates that can be used to present status updates to management • a level of confidence in meeting a project’s completion date based on data about risks and opportunities for the project. • necessary schedule contingency and high priority risks based on conducting a robust schedule risk analysis 	<p>5 Verifying that the schedule is traceable horizontally and vertically</p> <p>8 Conducting a schedule risk analysis</p>
<p>Controlled, being</p> <ul style="list-style-type: none"> • updated periodically by schedulers trained in critical path method scheduling • stated using actual progress and logic to realistically forecast dates for program activities • compared against a documented baseline schedule to determine variances from the plan • accompanied by a corresponding baseline document that explains the overall approach to the project, defines assumptions, and describes unique features of the schedule • subject to a configuration management control process 	<p>9 Updating the schedule with actual progress and logic</p> <p>10 Maintaining a baseline schedule</p>

Source: GAO.

Figure 3. “Schedule Assessment Guide Best Practices for project schedules”¹⁸

¹⁸ US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules”. Retrieved from <https://www.gao.gov/assets/690/687052.pdf>

Defense 1.2: Mobilization Payment Contingent upon Submittal and Approval of the Baseline Schedule

Defense 1.3: Scheduling Start at Notice of Award

Defense 1.4: Include a Milestone for the Baseline Schedule Submittal and Approval

Author Analysis and Recommendations Defense 1.2, 1.3 and 1.4:

The owner should use the Notice to Proceed, (NTP) (see Figure 3 below) as the condition precedent to the contractor mobilizing the site. By using the NTP as the milestone (1.4) that signals the “official” start of the project rather than the “Notice of Award” it sets the stage for the contractor to bill for mobilization only after the NTP has been issued and the contractor has physically completed mobilization of the site.

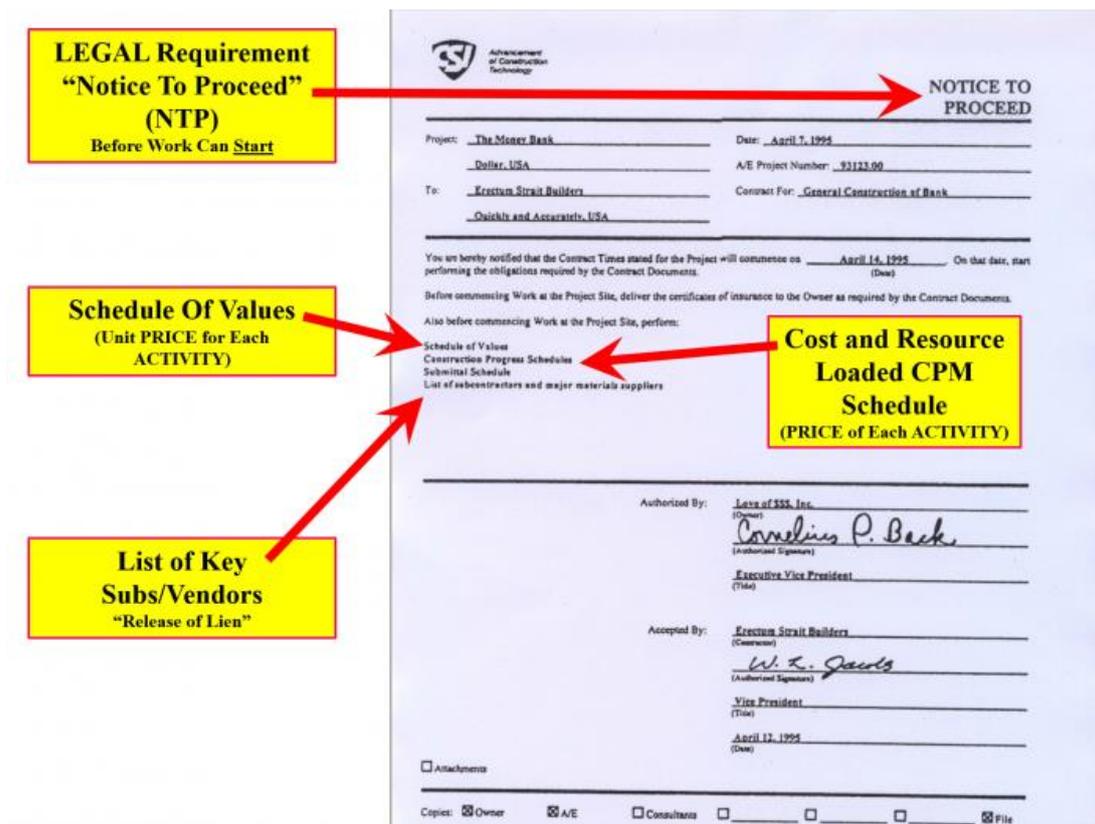


Figure 4. Typical "Notice to Proceed" (NTP) document¹⁹

¹⁹ Guild of Project controls compendium and Reference (CaR). Managing scope – Creating the control accounts. Retrieved from <http://www.planningplanet.com/guild/gpccar/creating-control-accounts>

Defense 1.5: Pre-Construction Scheduling Conference

Author Analysis and Recommendations Defense 1.5

The owner should use the Notice to Proceed, (NTP) (see Figure 3), as the condition precedent to the contractor mobilizing the site. This NTP should be shown during a pre-construction scheduling conference held by the owner.

Defense 1.6: Preliminary or 90 Day Schedule

Author Analysis and Recommendations Defense 1.6

The owner should use the Rolling Wave Planning, (see **Figure 5**), as the condition precedent to the contractor mobilizing the site. In this way, the contractor won't create this preliminary schedule only to meet the requirements.

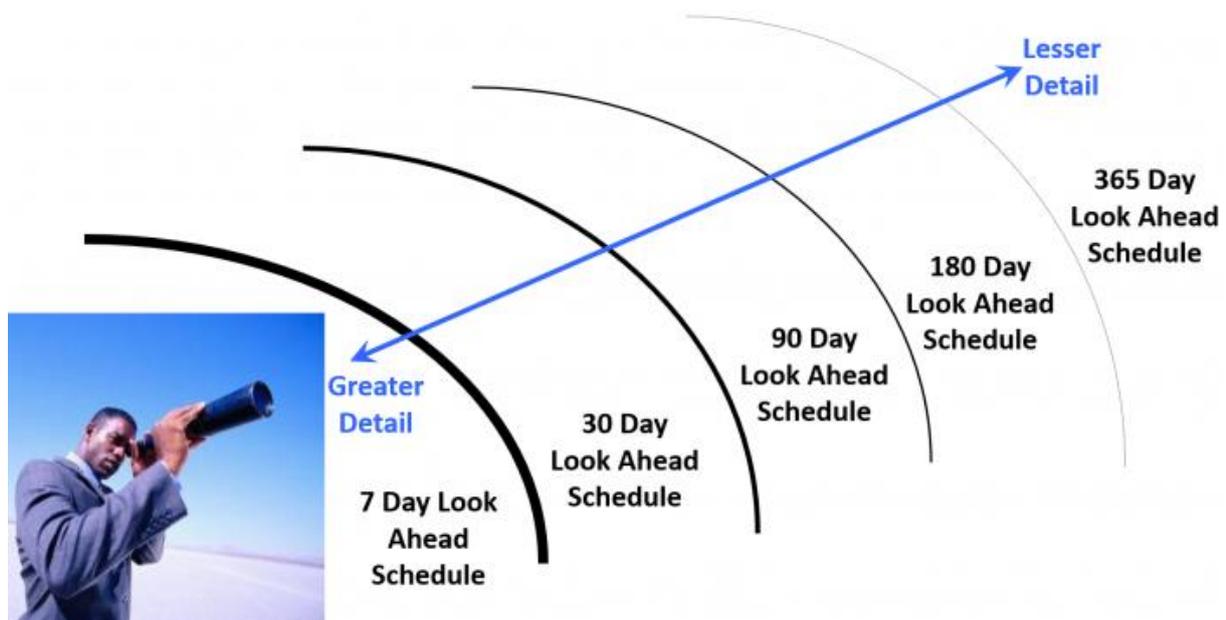


Figure 5. "Rolling Wave Planning" Illustrated²⁰

Defense 1.7: No Work Started until Schedule Submitted

Author Analysis and Recommendations Defense 1.7

The owner should use the Notice to Proceed, (NTP) (see **Figure 3**), as the condition precedent to the contractor mobilizing the site.

²⁰ Giammalvo, Paul D (2015) Course Materials. Contributed Under [Creative Commons License BY v 4.0](https://creativecommons.org/licenses/by/4.0/)

Game 2: Inadequate Scheduling

Defense 2.1: Detailed Scheduling Specification

Author Analysis and Recommendations Defense 2.1

According to this Model Scheduling Specification²¹, the owner should include a specification in the contract with the contractor. This specification should include the following clauses:

- a) Definition of the scheduling terms of the contract
- b) Administrative requirements with the general requirements and the exact required schedules
- c) Technical requirements including software compatibility requirements, schedule requirements and schedule submission requirements

The author recommends that the specification requires that schedules submitted by the contractor to the owner meet the requirements defined by the US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules” <https://www.gao.gov/assets/690/687052.pdf> . More specifically, Appendix II- An Auditor’s Key Questions and Documents.

Defense 2.2: Minimum Number of Activities

Author Analysis and Recommendations Defense 2.2

Sometimes, the number of activities in the project schedule is inadequate to the complexity of the project. In fact, “The schedule should reflect all activities as defined as being necessary by the scope reflected by the project Work Breakdown Structure »²².

The Author recommends that the owner follow the several outputs and tools identified in **Figure 6** (see below) in order to define the appropriate minimum number of activities.

²¹ Model Scheduling Specification Retrieved from https://ftp.dot.state.tx.us/pub/txdot-info/ta/ih635/addendum11/5_reference_information_documents/11%20-%20studies%20and%20reports/technical%20resources/primavera%20model%20schedule%20specification.pdf

²² GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR). Managing Planning & Scheduling – Identify/ Capture all project activities.

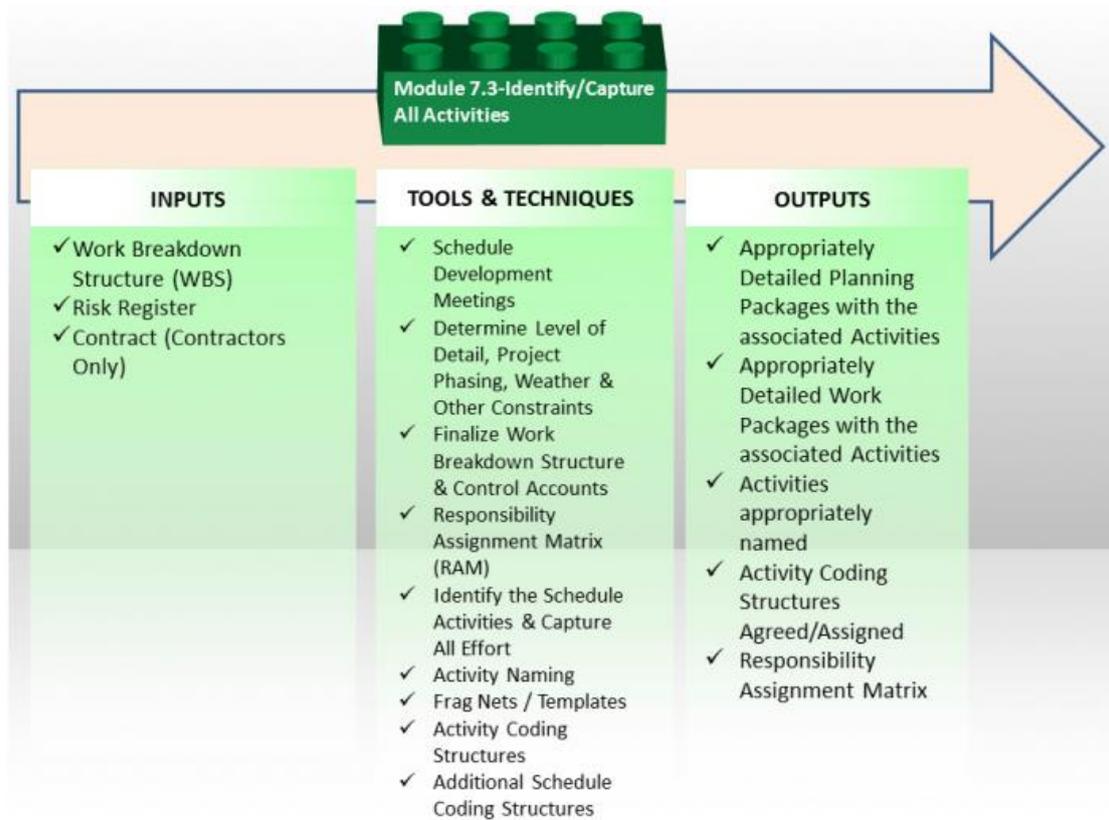


Figure 6. Identify / Capture all schedule activities Process Map²³

Defense 2.3: Maximum Duration Requirement

Author Analysis and Recommendations Defense 2.3

An adequate minimum/maximum duration requirement should help the contractor to build the schedule. The Author recommends that the owner should use the inputs and tools & techniques identified in **Figure 7** (see below) in order to calculate the appropriate duration of each activity.

²³ Guild of Project Controls. Managing Planning & Scheduling – Calculate the duration of each activity

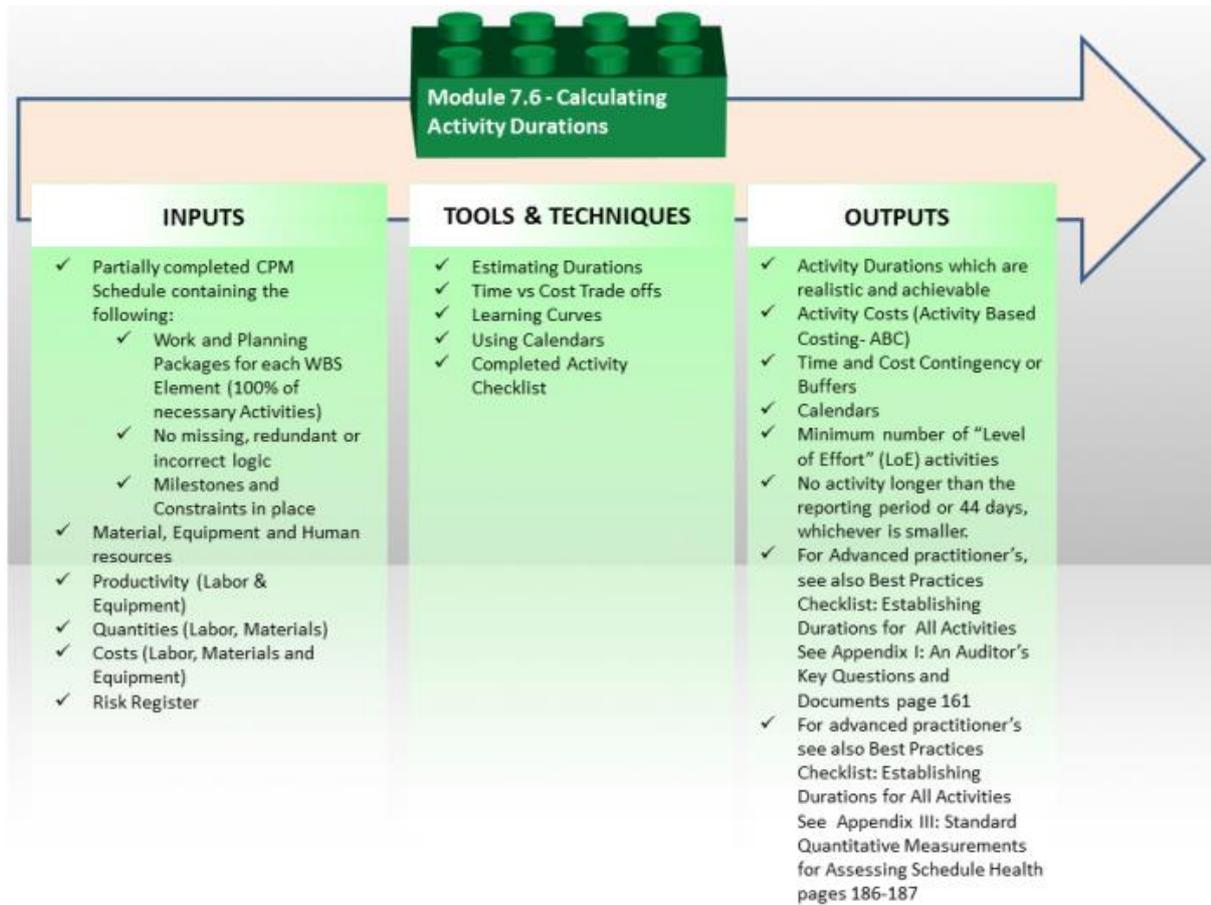


Figure 7. Calculate the Duration of each activity Process Map²⁴

Defense 2.4: Dedicated Scheduler

Defense 2.6: Owner's Scheduler/Scheduling Consultant

Author Analysis and Recommendations Defense 2.4 and 2.6

In order to avoid inadequate scheduling, the Author recommends that “the scheduling specification may require that the project have a dedicated scheduler.”²⁵ The scheduler job should be the one and only job of this person, fully involved in the creation and update of the

²⁴ Guild of Project Controls

²⁵ Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>

schedule. The Author recommends that the missions of the scheduler should follow the missions identified by the US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices²⁶ for project schedules:

- a) Creation of the schedule
- b) Edition of the schedule
- c) Review of the schedule
- d) Update of the schedule

Defense 2.5: Contractor’s Project Management Involvement

Author Analysis and Recommendations Defense 2.5

The Author recommends that the owner includes in the NTP a specification that meet the following inputs, tools and techniques and outputs identified in Figure 8 (see below).

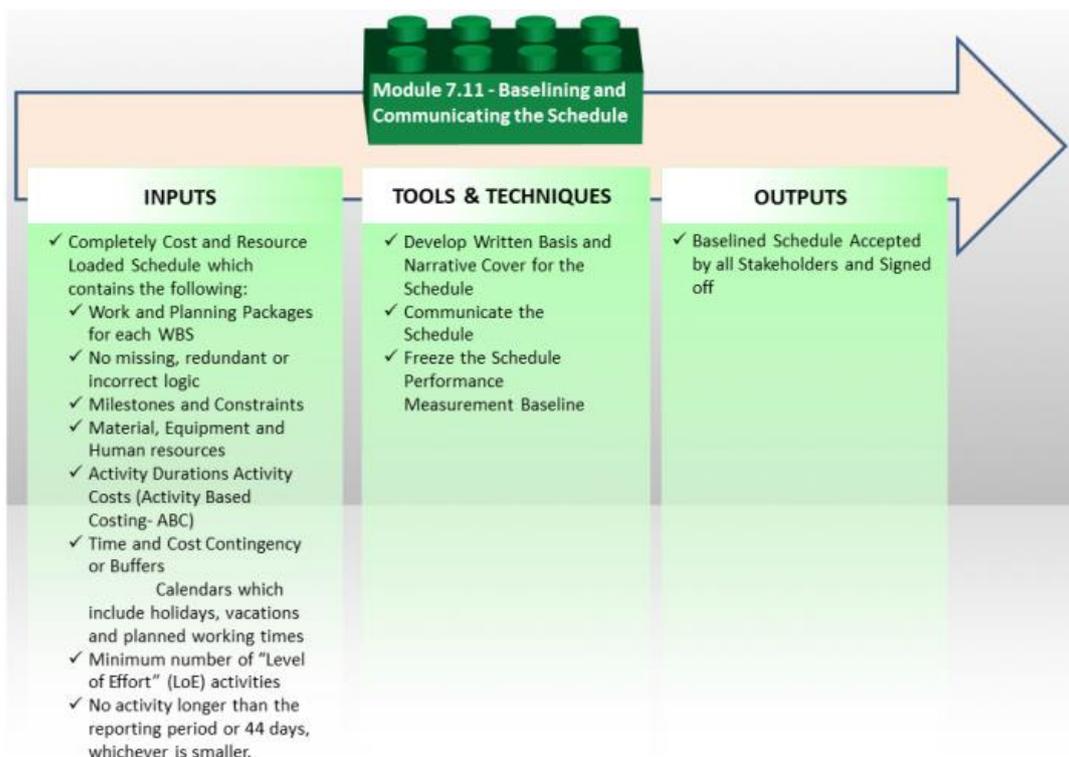


Figure 8. Validating, Baselining and Communicating the Schedule Process Map²⁷

²⁶ US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules”. Retrieved from <https://www.gao.gov/assets/690/687052.pdf>

²⁷ Guild of Project Controls

Defense 2.7: Scheduling System Requirements

Author Analysis and Recommendations Defense 2.7

The owner should use the Notice to Proceed, (NTP) (see Figure 3), as the condition precedent to the contractor mobilizing the site. The NTP should contain the appropriate software that the owner wants to use.

Game 3: Submittal Review Time

Defense 3.1: Minimum Owner/Engineer Review Time

Defense 3.2: Resubmittals – The Same Review Time

Author Analysis and Recommendations Defense 3.1 and 3.2

The owner should include in the NTP the minimum acceptable Review Time to be put in the schedule for submittals and resubmittals, according to the nature of the review. The owner should establish a list of the different type of reviews with their minimum acceptable duration. It could be based on their lessons learned.

Game 4: Failure to Show Submittal Review

Defense 4.1: Submittal Reviews Incorporated Into the Schedule

Defense 4.2: Submittal Schedule

Author Analysis and Recommendations Defense 4.1 and 4.2

The owner should include in the contract with the contractor two specifications according to the two following requirements:

- 1) "Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review a preliminary Schedule of Submittals."²⁸

²⁸ EJCDC C-700 general conditions,

2) “The Contractor shall prepare and keep current, for the Architect’s approval, a schedule of submittals which is coordinated with the Contractor’s construction schedule and allows the Architect reasonable time to review submittals.”²⁹

Defense 4.3: Define Work Breakdown Structure (WBS) Coding Structure

Author Analysis and Recommendations Defense 4.3

The owner should include in the NTP the level of detail wanted in the Work Breakdown Structure. The inputs, tools & techniques needed by the contractor and the outputs expected could be defined following those of the Figure 9 (see below).

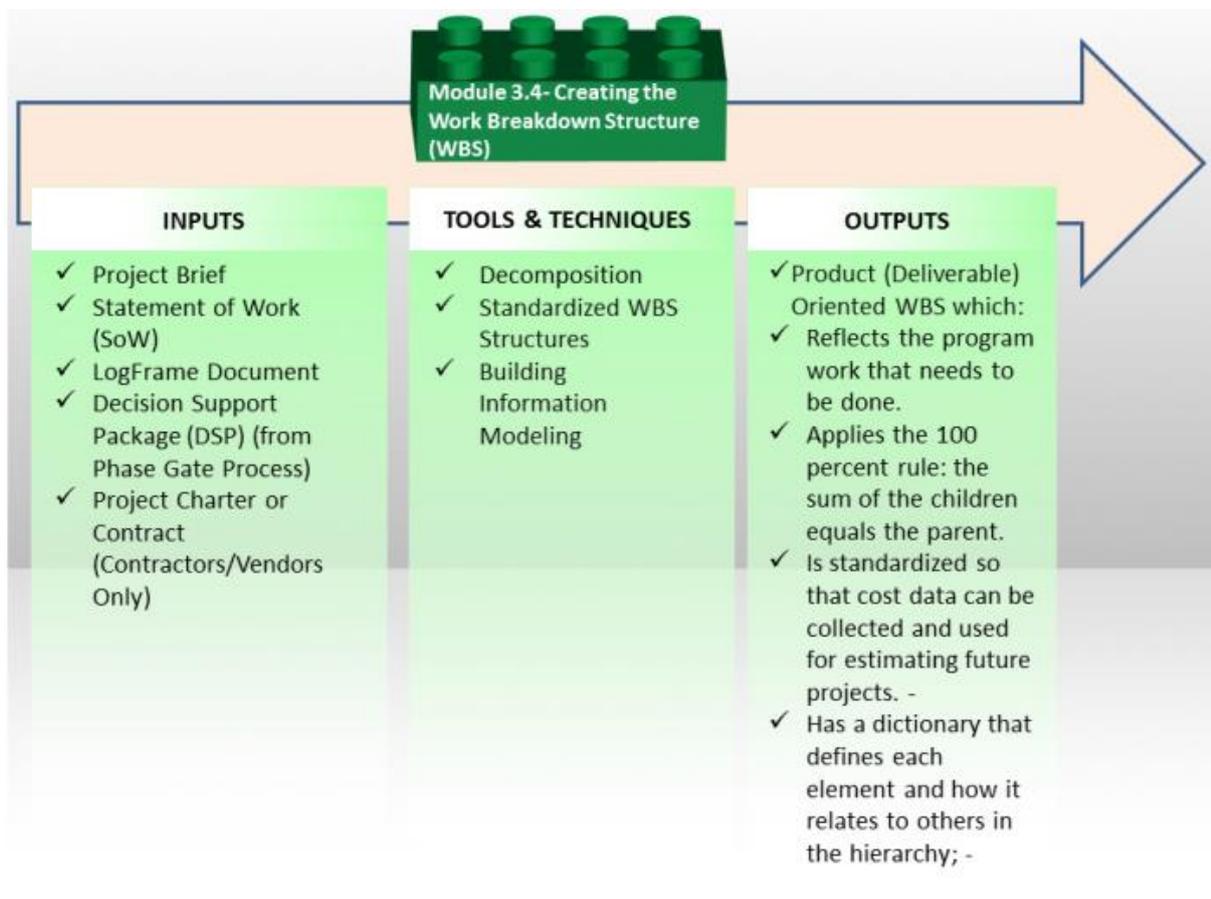


Figure 9. Creating the Work Breakdown Structure Process Map³⁰

²⁹ AIA A201 general conditions, Section 3.10.2

³⁰ Guild of Project Controls

Game 5: Delivery Dates for Owner Furnished Equipment or Materials

Defense 5.1: Not Earlier Than Delivery Dates for Owner Furnished Items

Defense 5.2: Schedule Windows for Delivery of Owner Furnished Items

Author Analysis and Recommendations Defense 5.1 and 5.2

The Author recommends that the owner includes in the NTP the earliest and latest delivery dates for every furnished item.

Game 6: Failure to Show Procurement Activities

Defense 6.1: Incorporation of Fabrication, Delivery and Installation Activities

Author Analysis and Recommendations Defense 6.1

The owner should model fabrication, delivery and installation activities as “one activity or a sequence of activities representing the whole procurement process, starting with ordering the product and ending with its receipt. » according to the US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules”.³¹

Defense 6.2: Separate Equipment Procurement Schedule

Author Analysis and Recommendations Defense 6.2

The owner should use the Notice to Proceed, (NTP) (see Figure 3) as the condition precedent to the contractor mobilizing the site. The NTP should include a requirement in which the contractor « shall provide a schedule printout showing the anticipated order and delivery dates for each major piece of equipment on the project ». ³²

³¹ US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules”. Retrieved from <https://www.gao.gov/assets/690/687052.pdf>

³² Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>

Defense 6.3: Define WBS Coding Structure

Author Analysis and Recommendations Defense 6.3

The owner should include in the NTP the level of detail wanted in the Work Breakdown Structure. The inputs, tools & techniques needed by the contractor and the outputs expected could be defined following those of the **Figure 9**.

Game 7 : Failure to Include Contract Schedule Constraints

Defense 7.1: Schedule, Logic and Operating Constraints, and Sequences Listed in Specifications

Defense 7.2: Interim Milestone Dates

Defense 7.3: Specified Constraints and Sequences Correctly Reflected in Schedule

Author Analysis and Recommendations Defense 7.1, 7.2 & 7.3

The owner should list all schedule constraints he would like to have and include them in the Notice to Proceed (See **Figure 4**).

Game 8: Phony Early Completion Schedules

Defense 8.1: Pre -Bid Project Scheduling

Author Analysis and Recommendations Defense 8.1

The owner should ask a construction scheduler to perform a pre-bid project scheduling.

Defense 8.2: “Joint Ownership of Float” Clause

Author Analysis and Recommendations Defense 8.2

The owner should add a specification in order to explain and define who of the contractor or owner owns the float. Two major types of float exist³³:

³³ <https://www.gao.gov/assets/690/687052.pdf>

The owner should require the low bidder to “submit the backup documents used in bid preparation shortly after bid opening (usually 48 to 72 hours)”³⁵.

Defense 8.7: Banked Float Requirement

The owner should include the rules of banked float and include it in the contract documents.

Game 9: Preferential Logic

→ No defense was identified.

Game 10: Sequestering of Float

Defense 10.1: Thorough Review of Baseline and Schedule Updates

Author Analysis and Recommendations Defense 10.1

The Author recommends the creation of a proper control process that will ensure that “the baseline and current schedule are accurate and reliable”.³⁶

Defense 10.2: Subcontractor Participation Requirement

Author Analysis and Recommendations Defense 10.2

The Author recommends that the specification requires that schedules submitted by the contractor to the owner involves the contractor’s subcontractors.

Defense 10.3: “Non-Sequestering of Float” Clause

Author Analysis and Recommendations Defense 10.3

³⁵ Recommended Contract Practices for underground construction. William W. Edgerton. Retrieved from https://books.google.fr/books?id=dCBOWVal1AIC&pg=PA104&lpg=PA104&dq=escrow+of+bid+documents+tra+duction&source=bl&ots=rFoP-eJilD&sig=Lm2D0B4VrkaViOql4R49iUkJ-ao&hl=fr&sa=X&ved=2ahUKEwjL-f-V8pnfAhUIJhoKHb_NBwYQ6AEwBHoECAcQAQ#v=onepage&q&f=false

³⁶ Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*.

The author recommends that the scheduling specification requires that a non-sequestering of float clause. The clause should "allow owners to reject schedule submittals where contractor has sequestered float"³⁷.

Defense 10.4: Resource Loading of Schedule Activities

Author Analysis and Recommendations Defense 10.4

The owner should proceed to a resource loading procedure for the major part of the activities following the process shown in figure 11.

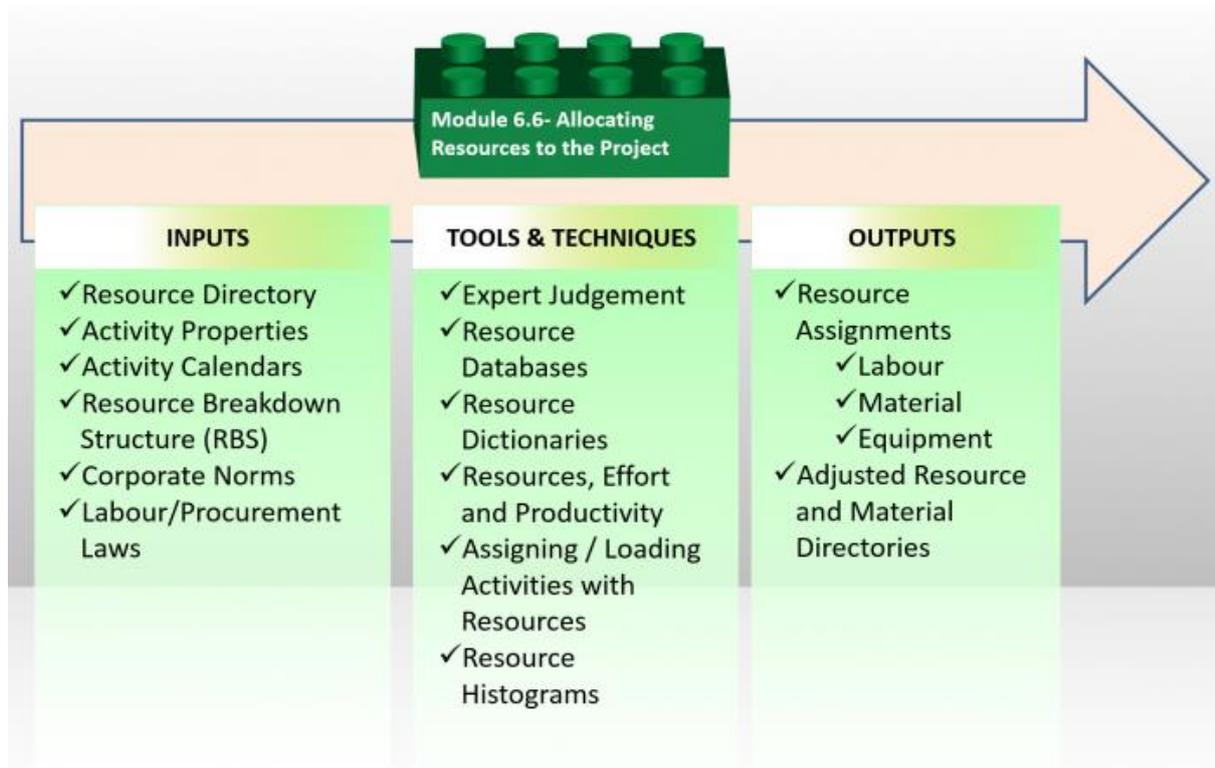


Figure 11. Allocating Resources Process Map³⁸

Game 11: Failure to Include Start Up/Testing Activities

Defense 11.1: Estimate Time for Start-Up and Testing Activity

³⁷ Early Completion Schedules – Benefits, risks & defenses. Emily Federico, James G. Zack, JR. Retrieved from <http://www.fplotnick.com/constructioncpm/2018Presentations/EarlyCompletionSchedules.pdf>

³⁸ Project of Guild Controls Compendium and Reference (CaR). Planning Planet. Managing Resource Acquisition/ Allocation – Allocating Resources

Author Analysis and Recommendations Defense 11.1

As the owner has more knowledge accounting to the estimation of the time needed in order to estimate time for start-up and testing activities, the contract should contain:

- a) all the activities estimated for start-up and testing with their estimated duration
- b) a minimum time requirement for the contractor to spend on the start-up and testing activity

Game 12: No Schedule Updates

Defense 12.1: Construction Scheduling – Pay Item on the Schedule of Values

Defense 12.2: “Pay Off the Schedule” Specification

Author Analysis and Recommendations Defense 12.1 & 12.2

The owner should add a specification in order to provide the contractor with a financial incentive. Payments will depend on the contractor submitting the updated schedules.

Defense 12.3: Liquidated Damages Associated with Schedule Submittals

Author Analysis and Recommendations Defense 12.3

The owner should add a clause in the contract including the following specificities: “establish a reasonable value of the damages to be incurred by the owner in the event that the contractor fails to submit schedule updates in a timely manner ».³⁹

Defense 12.4: Withholding of Payment for Failure to Update Schedule

The owner should add a clause saying that payment won’t occur without the proper schedule updates.

Game 13: Inaccurate Schedule Updates or Inaccurate As-Built Information

³⁹ Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>

→ No defense was identified.

Game 14: Inaccurate Schedule Updates – Scheduling Away Project Delay

Defense : If the as-built progress up to the data date is behind schedule, as compared to the baseline schedule, the contractor may change durations and/or logic of future activities to offset the exact amount of delay thereby producing an update that shows that the project is “on schedule” when in reality it is behind schedule.

Game 15: Changing Project History

→ No defense was identified.

Game 16: Changing Project Calendars

Defense 16.1: Spot Check Project History/Schedule Change Report

The owner should ask by a requirement that the contractor submit a report for each schedule.

Defense 16.2: Joint Updating Requirement

The owner should add a requirement in the contract documents demanding for a meeting between all major subcontractors.

Defense 16.3: Addition of Activities for Resubmittals

Author Analysis and Recommendations Defense 16.3

The owner should clearly identify who of the owner or the contractor is responsible for each activity, including it in the contract documents.

Defense 16.4: Electronic Submittal of Schedule Submittals

Author Analysis and Recommendations Defense 16.3

The owner should establish an electronic submittal for each schedule submittals.

Defense 16.5: Recorder of the Schedule Requirement

The owners' scheduler should record each month in a computer the list of changes provided by the contractor.

Defense 16.6: Weekly Progress Reports

Author Analysis and Recommendations Defense 16.6

The owner should include in the requirements the frequency of the weekly progress reports he thinks necessary in order to control and monitor progress. It is important for the owner to be able to have access to the latest update of the schedule.

Game 17: Failure to Incorporate Change Orders Into Schedule Updates

Defense 17.1: Time Impact Analysis Requirement

Author Analysis and Recommendations Defense 17.1

The owner should include a Time Impact Analysis (TIA) requirement in each "change proposal or time extension request". This TIA should follow the method described in Figure 10.

Steps	Procedure
1	The delay should be described as simply as possible with the fewest number of activities reflecting the project delay.
2	Select the schedule to impact. The schedule should be the latest updated schedule for the project.
3	Add the impact activities and make the necessary adjustments to the project schedule.
4	Recompute the CPM and note a change in the project completion date.
5	Determine the amount of project delay.
6	Determine the actual dates of the delays using the original schedule.

Figure 12. Procedure to perform a Time Impact Analysis⁴⁰

⁴⁰ How to Perform a Time Impact Analysis in Construction. Juan Rodriguez (2018) Retrieved from <https://www.thebalancesmb.com/time-impact-analysis-844407>

Defense 17.2: Fee for Change Order Schedule Analyses

The owner should add a specification in the contract documents specifying that contractor may receive a payment for each change order.

Game 18: After the Job "But For" Schedules

Defense 18.1: As Built CPM Submittal "Condition Precedent" to Retainage Release

Author Analysis and Recommendations Defense 18.1

The owner should ask for an "as built" schedule and insert this demand in the contract documents. The as built schedule should follow these steps, according to Andrew Avalon in "Calculating the as-built critical path"⁴¹:

- 1) Identification of as-built dates for activities
- 2) Calculation of logic and activity durations
- 3) Removal of actual dates, registration of durations and logic, recalculation of the schedule

Game 19: Substantial Completion Activity

Defense 19.1: Define Substantial Completion

Author Analysis and Recommendations Defense 17.1

The owner should agree with the term of "substantial completion" before the bidding and include this definition in the contract. The substantial completion should agree with this definition: "the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. »⁴²

⁴¹ Calculating the as-built critical path, Andrew Avalon. Retrieved from http://www.long-intl.com/articles/Long_Intl_Calculating_the_As-Built_Critical_Path.pdf

⁴² Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*

CONCLUSION

It is worth to highlight that the main purpose of this paper was to help, give advices and support owners beginning a construction project. As the construction industry is a booming sector, lots of projects are being carried on. The need for construction projects is inevitable as they make part of several sectors and involve many different stakeholders. The construction industry is a big industry and creates a lot of jobs.

The primary objective of my study was first to understand the different games that can be played by contractors in these construction projects. These games can be the result of a misunderstanding between contractors and owners, but also of a lack of knowledge from contractors. In this case, contractors have no bad idea in mind. Simply respecting the rules and specifications explained in the paper will allow both contractors and owners to address gaps in the contract which links them. However, these games can also be the result of real desire and need of the contractor to manipulate schedule in order to gain benefits and be able to create claims. As the owner doesn't know the sincerity of the contractor, it is his duty to apply, for every project, the several rules explained here. A meticulous job will be required at the beginning but it will allow one to save a lot of time in the future.

BIBLIOGRAPHY

1. Planning and Scheduling. Cooperative Governance Traditional Affairs. Retrieved from <http://www.cogta.gov.za/mig/toolkit/TOOLBOX/PM/Planning%20and%20Scheduling.pdf>
2. Guild of Project Controls. Planning, scheduling, cost management and forensic analysis (Planning Planet). (s.d.). Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-planning-and-scheduling>
3. Guild of Project Controls. The Purpose of the Project Schedule
4. Stumpf, G. R. (2000). Schedule delay analysis. *Cost Engineering*, 42(7), 32-43. Retrieved from <https://search.proquest.com/docview/220446193?accountid=42874>
5. Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*, 24(4), 349-357. doi:10.1016/j.ijproman.2005.11.010
6. The Purpose of the Project Schedule | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (2009). Retrieved from <http://www.planningplanet.com/wiki/422495/purpose-project-schedule>
7. James G. Zack, Jr. (2015) Ghost Schedules – What, why & what's the risk? Navigant Construction Forum.

8. Effects of Construction Projects Schedule Overruns: A Case of the Gauteng Province, South Africa. (n.d.). Retrieved from <https://www.sciencedirect.com/science/article/pii/S2351978915009907>
9. How firms can avoid the construction schedule float game. Allen Chilmeran (July 26, 2017)
10. Amanda Jo Amadon, Emily Federico, Stephen Pitaniello, & James G. Zack. (n.d.). Construction scheduling games – Revisited & updated. *Construction Forum*. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/Construction%20Scheduling%20Games%20-%20Revisited.pdf>
11. Model Scheduling Specification; Retrieved from https://ftp.dot.state.tx.us/pub/txdot-info/tta/ih635/addendum11/5_reference_information_documents/11%20-%20studies%20and%20reports/technical%20resources/primavera%20model%20schedule%20specification.pdf
12. US Government Accountability Office (GAO) “Schedule Assessment Guide Best Practices for project schedules”. Retrieved from <https://www.gao.gov/assets/690/687052.pdf>
13. Guild of Project Controls. Managing scope – Creating the control accounts.
14. Giammalvo, Paul D (2015) Course Materials. Contributed Under [Creative Commons License BY v 4.0](https://creativecommons.org/licenses/by/4.0/)
15. Mubarak, S. (2060). Construction Project Scheduling and Control. Hoboken, USA: John Wiley & Sons.
16. Guild of Project Controls. Managing Planning & Scheduling – Identify/ Capture all project activities.
17. Guild of Project Controls. Managing Planning & Scheduling – Calculate the duration of each activity
18. EJCDC C-700 general conditions,
19. AIA A201 general conditions, Section 3.10.2
20. Who owns the float ? Stevan Evans, Retrieved from <http://www.stevencevans.com/float/>
21. Recommended Contract Practices for underground construction. William W. Edgerton. Retrieved from https://books.google.fr/books?id=dCBOWVal1AIC&pg=PA104&lpg=PA104&dq=escrow+of+bid+documents+traduction&source=bl&ots=rFoP-eJiID&sig=Lm2D0B4VrkaViOql4R49iUkJ-ao&hl=fr&sa=X&ved=2ahUKEwjL-f-V8pnfAhUIJhoKHb_NBwYQ6AEwBHoECACQAQ#v=onepage&q&f=false
22. Early Completion Schedules – Benefits, risks & defenses. Emily Federico, James G. Zack, JR. Retrieved from <http://www.fplotnick.com/constructioncpm/2018Presentations/EarlyCompletionSchedules.pdf>

23. Guild of Project Controls. Managing Resource Acquisition/ Allocation – Allocating Resources
24. How to Perform a Time Impact Analysis in Construction. Juan Rodriguez (2018) Retrieved from <https://www.thebalancesmb.com/time-impact-analysis-844407>
25. Calculating the as-built critical path, Andrew Avalon. Retrieved from http://www.long-intl.com/articles/Long_Intl_Calculating_the_As-Built_Critical_Path.pdf
26. Analysis of project delay - Theoretical or interrogation of the facts ? (n.d.). Retrieved from http://www.planningplanet.com/sites/default/files/guild_articles/1/a1_analysis_of_project_delay_....._small.pdf
27. U.S. Department of Transportation. (2011, December). Work zone road user costs - Concepts and applications. Retrieved from <https://ops.fhwa.dot.gov/wz/resources/publications/fhwahop12005/fhwahop12005.pdf>
28. Managing project changes. (n.d.). Retrieved from <https://www.projectinsight.net/project-management-basics/managing-changes>
29. <https://www.aiacontracts.org/contract-documents/25131-general-conditions-of-the-contract-for-construction>
30. <http://www.traunerconsulting.com/wp-content/uploads/Manginelli-Shared-Float-Article-FINAL-docx.pdf>
31. http://www.long-intl.com/articles/Long_Intl_Calculating_the_As-Built_Critical_Path.pdf

About the Author



Lisa Di Cosmo

Paris, France



Lisa Di Cosmo is a Project Management professional and wants to become an International Business Developer.

Born in Paris, Lisa comes from a multicultural family. With an Italian father and an Argentinian mother, she had the opportunity to travel a lot to several continents and to become trilingual. In fact, she is fluent in Spanish and Italian.

Since 2016, she studies at SKEMA Business School, the 7th best-ranked French Business School. She had the chance to fly to Suzhou, where she stayed one semester to study on the SKEMA's Chinese Campus. She learned International Finance, Corporate Governance and International Negotiation. Loving languages, she made solid foundations in Chinese. In September 2018, she specialized in the Master of Science "Project and Programme Management & Business Development". She was able to exercise her skills of Project Manager during the different courses of Global Project Management and Sustainable Project Management. Moreover, she successfully passed two international certifications which are Prince 2 Foundation and Agile PM. Willing to develop more Project Management skills, she will pass the Prince 2 Practitioner certification next year.

In January, she will start a Business Developer internship in the company Wonderbox, a French company. After this internship, she wants to discover Project management in a professional way, this is to say in an internship. Loving challenges, she aims to become a great Project Manager.

Lisa lives in Paris, France, and can be contacted at lisa.dicosmo@skema.edu.

To find more information about Lisa Di Cosmo, visit her LinkedIn profile at <https://www.linkedin.com/in/lisa-di-cosmo>