



**Project Services Pty Ltd**

## **DELAY, DISRUPTION AND ACCELERATION COSTS**

By

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## INTRODUCTION

Delay and disruption costs are common in the construction and engineering industries and are becoming more common in other projects. This type of claim usually appears after normal contract processes are being severely tested, and the contractor has engaged 'experts' to assist in its cause.

Unfortunately, most prolongation / disruption claims seem to result in a value that appears to be the result of squaring your grandmother's age and multiplying the answer by the latest Australian cricket score. This paper examines the theoretical underpinnings of 'delay and disruption' costs.

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## THE EFFECT OF CHANGE

### Sources of Change

The sources of change within a project are virtually unlimited. A few options include:

- Changes from the initial design caused by the designer altering or refining elements of the design.
- Changes from the initial design caused by the client requiring modifications to the design (variations / instructions).
- Changes from the initial design caused by latent conditions and/or new information.
- Differences between the productive capabilities of the actual people working on project tasks compared to the anticipated productive capability used to prepare the project schedules, work plans, estimates, etc.
- Differences in the numbers of workers actually working on any given day compared to the planned number.
- Estimating errors in either the schedule or the pricing causing supply problems (remembering there is no such thing as an 'accurate estimate' – all predictions of the future contain errors).
- Differences in the capabilities of the project management team to manage, direct, motivate and lead the project workforce (compared to the anticipated capabilities).
- Management decisions to re-sequence, change or deviate from the project plans.
- Etc, etc, etc.....

In all of the above, the net consequence to the overall progress of the project may be beneficial or detrimental<sup>1</sup>. And isolating the cause and consequence of any one change or any one delay is fraught with difficulty.

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<sup>1</sup> The overall management of change in a project is discussed in *Integrated Change Control* <https://mosaicprojects.com.au/PMKI-PBK-010.php#Process5>



### The Effects of Change

When a change impacts the work of a project, two key effects are noticed:

- The progress of the works may be directly delayed (eg, waiting for changed design information)<sup>2</sup>.
- The productive efficiency of the workers undertaking the works is reduced through the need to recognise the change and reorganise, re-sequence, relocate and/or redo or alter work already done.

In the absence of mitigating actions, the loss of productive efficiency will of itself cause delays to the progress of the project's works. It therefore follows, that the single end result of all changes impacting the project's work is to cause delay to the completion of the work. Generally, the two effects identified above are experienced at the same time; each change causes some direct delay and some consequential delay due to reduced efficiencies (these effects happen even if the net result of the change is beneficial).

The options for dealing with the effects of change, either separately or in combination, include:

- Accepting the delay, either by simply allowing the work to finish late (this is appropriate if both the task and the resources are not critical) or by agreeing appropriate extensions of time for the completion of the works.
- Accepting the delay because the change is inherently beneficial, the time savings generated by the change are only marginally diminished by the effect of the change on productivity.
- Mitigation where additional capability or resources are deployed to overcome the effect of the delay. Mitigation can include:
  - Management actions to change the planned sequence of work to eliminate the effect of the delay (redeploy resources).
  - Management actions to change work methods, etc to capitalise on opportunities created by the change and achieve a net benefit to the project.
  - Management actions to increase the productive capability of the overall project workforce to achieve the remaining works in a reduced timeframe.

The costs and consequences of the delay caused by each change and the options to mitigate the delay require the balancing of many complex issues.

- Time costs money; any delay to the completion of the project's work will inevitably result in increased costs from elements such as general supervision costs, project establishment costs, insurance costs, etc (ie, all types of 'overhead costs') plus potentially the application of damages or Liquidated Damages.
- The cost implications of management actions can be positive or negative if the changed sequencing or work methods result in more efficient work processes there can be net savings (this is the underlying principle behind Value Engineering) alternatively some additional costs may be incurred.

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<sup>2</sup> Methods used for assessing the extent of delay is discussed in:

- **Assessing Delay and Disruption – Tribunals beware:**

[https://mosaicprojects.com.au/PDF\\_Papers/P035\\_Assessing\\_Delays.pdf](https://mosaicprojects.com.au/PDF_Papers/P035_Assessing_Delays.pdf)

- **Assessing Delay – the SCL Options:**

[https://mosaicprojects.com.au/PDF\\_Papers/P216\\_Assessing\\_Delay\\_The\\_SCL\\_Options.pdf](https://mosaicprojects.com.au/PDF_Papers/P216_Assessing_Delay_The_SCL_Options.pdf)



## Delay, Disruption and Acceleration Costs

- Increasing the productive capacity of the workforce either by extending working hours, increasing the capability of the workforce (and its equipment) and/or increasing the number of people deployed on the project may be:
  - Cost beneficial where the increased productive capacity completes the work sooner, saving on project 'time related' costs.
  - Cost beneficial where the increased productive capacity achieves an 'optimum crew size' and the overall work is more efficient.
  - Cost neutral (where the new workers can undertake work at the same level of efficiency as the existing workers).
  - Cost negative (where the increase in productive output is less than the costs incurred in increasing the size of the workforce), ie, the overall efficiency of the project workforce is reduced.

### Variations -v- Changes

A different aspect of change is the direct cost of a variation, a variation to change brass taps to gold taps will have an intrinsic variation cost (the difference in price between the two types of tap) it will also cause a 'change' to the work on the project. The impact of the change will depend on the timing of the variation compared to the actual progress of the project works; it **may** cause delay (waiting for the delivery of the taps) and **will** cause a certain amount of disruption (additional and reordered work). The disruption may be:

- Very minor, simply updating drawings, etc., and changing a future purchase order.
- It may be significant as already installed brass taps are removed and scrapped, work instructions, drawings, purchase orders, etc., are altered to accommodate the change, subcontractors seek payment for their costs, etc.

The 'variation cost' component remains relatively constant, the consequences of the 'change' and the costs associated with the delay and disruption caused by the change are highly variable and are influenced by its timing, the capability of the project to deal with change, and decisions made by the project's management team.

Identifying the complete cost and time consequences of a single change on a project is extremely difficult due to the interaction of all of the factors identified above; for these reasons, many contracts contain clauses that pre-set payments for delay on a daily basis. At least once the effect of the change has been quantified as a 'delay' the cost of the delay is certain.

### Delay and Disruption -v- Acceleration

What is clear is that when dealing with the consequences of 'change' in a project, delay and acceleration are opposite sides of the same coin. If the client instigates a 'change' to a project (eg, issues a variation order instructing additional work), the project can be compensated for the change by being granted an appropriate extension of time (EOT) to the project completion date and compensated for the cost of the delay. Alternatively, the project can be compensated for the change by being paid to accelerate the works to overcome the delay.



## Delay, Disruption and Acceleration Costs

As discussed previously, the only effect of change is a delay. The disruption and loss of productive efficiency in the workforce caused by 'change' manifests itself as delay to their work, and possibly to the overall project. Therefore, the manifestation of 'disruption costs' can occur in two ways.

- The project workforce (including plant and equipment) can be engaged on the site for longer than originally allowed in the project estimates. The work itself takes longer to complete and the project suffers the cost of its workforce being engaged for a longer period.
- Additional workers, staff and equipment are deployed on the project to overcome the effect of the delay by increasing production.

There can be no other general effects of 'disruption'; the only option to mitigate delay caused by disruption is to increase production!

Both of the above manifestations typically involve costs. Management action alone may achieve an increase in productivity (by finding ways to be more efficient, leading to increased production) but more typically an increase in production requires the deployment of more workers, staff, and equipment to the project; this is usually referred to as acceleration.

### Acceleration

The effect described as 'acceleration' is in fact a manifestation of 'disruption' (ie, it is the increased resources deployed to the project to overcome the effects of the delays caused to the works by disruption arising from various changes).

The acceleration may be voluntary (to overcome contractor induced delays or reduce time related costs) or undertaken in response to an instruction from the client to accelerate the works.

Constructive acceleration refers to the situation where the contractor feels obliged to accelerate because claimed EOTs have been rejected or are not being approved in a timely way and the contractor feels it is faced with the need to accelerate to avoid incurring penalties. If the contractor's assertions are later found to be valid, the failure to grant EOTs in a timely manner can be interpreted as an instruction to accelerate.

Once a decision to accelerate has been made, it is critical that every cost incurred is recorded. This is the only effective basis for substantiating a claim. The contractor needs to be able to establish what additional resources were brought to site and when, the amount of overtime worked, etc.

However, the claim for acceleration is never the direct costs of the additional resources (presumably these additional resources were productively engaged), the claim is the total cost of performing the works in accelerated mode, less the costs of performing the works normally.

Where acceleration is contemplated by the contractor, it is important that proper notice is provided to the client and detailed records are required. If these can be contemporaneously agreed as correct (usually without any acceptance of liability), the cost of future negotiations and/or litigation can be significantly reduced. At the end of the day, the contractor must establish its damages. Actual acceleration is not required. A valid contractor effort to accelerate, supported by contemporaneous records, is sufficient to establish constructive acceleration.



### Who Pays How Much?

Given the multi-faceted nature of the problem and the level of difficulty involved in dealing with individual issues, most attempts to resolve project/contractual issues involving delay, disruption and acceleration costs are approached from a 'whole of project' perspective.

The calculation of costs fall into three interlinked areas:

- Delay costs are the easiest to calculate, it is a simple summation of the costs of all non-productive plant, equipment, and staff plus a daily charge for all relevant overheads for the actual period of the delay.
- Disruption costs are more complex. Disruption costs are the additional time productive workers, staff, plant, and equipment are engaged on the project as a result of the delays caused by changes. It is the cost of the inefficiency caused by the change. These costs need to be moderated to allow for normal inefficiencies and nonworking times.
- Acceleration costs are the 'extra over' cost of additional resources (people, plant, equipment) brought to site to overcome the consequences of delay. If additional overtime is worked, the additional cost of the overtime component (not the base hours) can be claimed.

A 'shorthand' way to assess the net effect of disruption and acceleration is to compare the actual cost of the disrupted work to its estimated cost. However, this raises the question of validating the accuracy of the initial estimates. A better option may be the 'measured mile', to apply this technique find an undisrupted section of work, measure the costs of this and then compare to the cost of a disrupted section of the work. The increase (if any) is an indication of the disruption cost.

The problem in establishing a supportable claim is compounded by the need to differentiate the costs attributable to causes that can be claimed from the client from costs attributable to causes that are the responsibility of the contractor. If you review the list of 'sources of change' above, a significant majority of the items listed are directly under the control of the contractor not the client. Separating the components that can be reasonably charged from the ones that are the sole responsibility of the contractor will inevitably need the input of experts and lots of negotiation<sup>3</sup>.

### Resolving the Impasse

In the author's experience, the only effective option that allows a reasonable calculation of 'delay and disruption / acceleration' costs and the apportionment of the costs between the parties is the appointment of an expert to determine the values on behalf of the parties. The parties present their facts and assertions to the expert, comment on the other party's submissions and then the expert determines an amount. If the claim becomes the subject of litigation or arbitration with conflicting expert opinion on both sides the cost of assessing a reasonable value will often outweigh the value of the claim.

Theoretically, the costs of disruption can be calculated. In reality, determining if a drop in productivity was caused by inefficient work practices (the fault of the contractor) or a change

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<sup>3</sup> **Note:** The prerequisite for applying any of the analysis options discussed in this paper is a well-constructed CPM schedule. This is unlikely to be found in agile and distributed projects. For this type of project see:

***Assessing Delays in Agile & Distributed Projects:***

[https://mosaicprojects.com.au/PDF\\_Papers/P215\\_Assessing\\_Delays\\_In\\_Agile\\_+\\_Distributed\\_Projects.pdf](https://mosaicprojects.com.au/PDF_Papers/P215_Assessing_Delays_In_Agile_+_Distributed_Projects.pdf)



## Delay, Disruption and Acceleration Costs

instigated by the client, or a combination of both (and the appropriate proportions) is almost impossible; the detailed data needed to support the claim simply does not exist. From one perspective at least the 'costs' are obvious the difficulty is quantifying them.

However, a willingness to compromise and act reasonably, assisted by cooperative experts, is far more likely to lead to a reasonable payment for the 'obvious costs and consequences' of change than developing a multi-million dollar claim, fighting in courts and arbitration for months and hoping to win 10% to 15% at the end of the day.

### Conclusions

- All changes cause delay and disruption to the works on a project, even when the net effect of the change is beneficial.
- The changes may be the responsibility of the principal, the contractor, or other external influences. Most site instructions and variations constitute changes.
- Delay and disruption reduces the productivity of the workforce.
- The sole manifestation of the reduced productivity is delay.
- Delay can be accepted and where the delay is caused by the principal, the delay can be compensated by appropriate EOTs and EOT costs.
- Alternatively, the delay can be mitigated by accelerating the works.
- Accurately costing the overall delay, disruption and acceleration costs impacting a project is difficult and requires very good data.
- Apportioning the delay and disruption costs between the client and the contractor is nearly impossible and requires cooperative problem solving by the parties.

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