

Record keeping for contemporaneous delay analysis: a model for effective event management

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Increasingly sophisticated computer software is being utilized to support detailed critical path method (CPM) analysis for resolving delay and disruption claims. The accurate determination of entitlement is however still dependent on the quality of programme and progress information provided by all parties. A comparative analysis of record-keeping methods in the UK and the US reveals that there is less rigour to this practice in the UK, where parties are not required by the contract to provide such records. In most forms of US government construction contract the contractor is required to produce a schedule using CPM software and to regularly update this to reflect project progress and changes. Recent recommended best practice in the UK also stipulates that the contractor should keep reliable and accurate progress and programme records to assist contemporaneous assessment of the cause and effect of project changes. While not contractually imperative, a clear method of managing information is important in UK construction and engineering projects to facilitate more effective and accurate assessments of delay and disruption. The US experience and good practice approaches in the UK demonstrate the importance of implementing and establishing an ‘event management strategy and archive’ at the outset of projects.

Keywords: Delay analysis, records, change event, event archive, programme, claims

Introduction

No matter what project controls are put in place, unfortunately delay and disruption especially on large or complex projects are almost inevitable. As McCullough (1989) states, ‘The basis of most construction claims is a delay’. Delay is the situation where the works take longer than originally intended. Delays can be approval delays, information delays or work undertaken later than originally planned. (Williams *et al.*, 2003). The variable which is affected by the event is time-related. Disruption by contrast does not refer to the timing of the works but to the situation where the works are made more difficult by some act of hindrance or prevention by the employer.

Delays might be due to changes in the initial design, alterations to the specification and unforeseen circumstances such as unexpected ground conditions, poor weather or poor design which is only discovered during construction. Other delays are frequently caused by supply chain problems, for example suppliers not delivering components to site on time, or specialist manufacturers having problems with their off-site production processes. Delays and disruption can also be caused by people issues, for example individuals or organizations not responding to requested information within an appropriate time or individuals not agreeing on technical or management issues for an unreasonable period of time.

Change management principles have been developed to help manage delay as it happens and in so doing reduce the likelihood of disagreements regarding culpability for such delays and disruption. However, many projects still end up in disputes regarding

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extension of time (EOT) claims and/or prolongation claims after the project has finished (when relationships can start to break down). This situation is unlikely to change in the future. In paragraph 9.4 of the Latham Report, Latham states that disputes may arise despite everyone's best efforts to avoid them. Carnell (2000: 89) adds: 'It is a mistake to believe that the post Latham and Egan construction industries will be free from claims.'

Carnell (2000: 107) also states that disputes will arise not least because there will be instances where a genuine difference occurs, where the parties hold sincere but diametrically opposed opinions: 'One should not demonize construction disputes. The key is to understand the place in which disputes and the available mechanisms for their resolution occupy in the construction process.' Williams (2003) states that most good contractors will try to avoid getting into claims situations where possible. Zack (1993) however suggests that 'claimsmanship' often reduces transparency in the claims process and lists 11 'claim games' commonly played out by contractors on public projects.

The use of delay analysis is currently increasingly popular with the courts in identifying culpability and ascertaining damages. The increasing use of computers in recent years has enabled critical path programmes to be analysed and, using a range of assessment methods, highly complex projects can in theory be analysed for delays and disruption and very specific 'answers' regarding the impact of delay events on the programme are often provided to the courts.

The problem is that delay claims involve detailed investigation of the project, often retrospectively, which requires a vast number of documents to be reviewed and people to be interviewed, which can be a time-consuming and resource-hungry process. Alkass *et al.* (1995) discuss the effort involved in this and say that 70 per cent of the effort in a claim is spent on searching and organizing information. Effective delay analysis must consider all delaying events and is dependent on the 'facts' of the case. Facts in this sense mean the project's factual records, i.e. variations, correspondence, minutes of meetings, progress reports and so on. If this process is not managed effectively, claims can be at best very time-consuming to assess in terms of validity and at worst deceptively inaccurate.

Gibson (2003) states:

Too often do we see extension of time and delay claims submissions containing several lever arch files of these facts with no specific linkage to the alleged events that caused the delay. There may also be a bundle of computer printouts indicating the claimed effects but the causal link is not clearly defined. The referee is expected to find it and often it's like looking for a needle in a haystack!

The records kept on construction projects will be the main source of information on which claims for time or additional payments will be established by the contractor or assessed by the engineer or contract administrator. The importance of producing adequate delay documentation has been recognized for many years (Epling, 1984), and Jergeas and Hartman (1994) stipulate that good record-keeping is crucial in helping to avoid or resolve claims. There is a multitude of different types of records including correspondence, meeting minutes, delivery notes, progress records, site diaries, day work sheets, photographs and invoices (Scott, 1990). Updated programmes can also record progress. The purpose of keeping records is to enable the assessment of progress, to confirm work has been carried out and to record resource use and expenditure for payment.

The quality and rigour with which records are kept varies wildly between different organizations. Many have different procedures for keeping records and on many jobs quality procedures for record-keeping are not implemented effectively. Recent studies show that producing 'inadequate records' is among the principal generic causes identified as leading to delays in substantiation/assessment of EOT claims (Kumaraswamy and Yogeswaran, 2003). Courts and boards of contract appeals stress the importance of contemporaneous records in proving delay and other claims and often the outcome of such cases hinges on such documentation (Bramble and Callahan, 2000). However the production of information is often of insufficient quality to enable an effective investigation into issues of delay and disruption to be undertaken in retrospect, as Major and Ranson (1980) observe:

It is all too common, when seeking to establish what actually happened on a project, to find that even a considerable amount of investigation will produce only an incomplete picture. It will often be necessary to analyse minutes of progress meetings, valuations, diaries, and various charts and programmes which neither individually nor collectively enable an actual progress chart to be produced or a detailed history of the project to be written. This is a common and substantial area of failure in site and head office management.

Delays and disruption are therefore common, and although change management and delay analysis have been introduced to try and avoid and resolve delay and disruption claims it is suggested that they will never disappear. The problem is that records are kept in multiple forms inconsistently and in various locations, and because the analysis is normally retrospective and requires the assessment of disparate documents, it is always difficult to clearly show causation.

In recent years in the UK the importance of keeping contemporaneous records has become more widely understood with the development of the 'Delay and Disruption Protocol' (Society of Construction Law, 2002) by the UK's Society of Construction Law, which offers guidance on change management issues associated with the assessment of project delay and disruption.

Record keeping

There are a multitude of different types of records kept on construction projects, which are documented with varying degrees of rigour depending on who is responsible for their completion, as well as being dependent on project management effectiveness from one project to the next. The records that are of particular importance in the assessment of delay and disruption are daily logs, progress reports, period reports, job meeting minutes, programme updates and revisions. Such documents enable the continuing effect of problems to be communicated to all parties involved. However if these are not related clearly to specific delaying events they are unlikely to provide the required clarity of evidence needed to substantiate a claim effectively. Therefore separate and independent reports will often be required which are specifically aimed at documenting and substantiating a delay, including specific schedule analysis. The SCL protocol, which explains how parties should go about establishing a suitable project procedure to enable this, is perhaps the most well known recent document in the UK.

Key principles of the SCL protocol

The SCL protocol provides guidance on how to potentially resolve matters that might lead to disputes regarding extension of time and/or compensation for the additional time and resources required to complete a project. The principle objectives of the protocol (Black and Caletka, 2002) can be defined as trying to promote:

- agreed critical path at time of delay;
- agreed float available at time of delay;
- agreed EOT entitlement at time of delay; and
- agreed compensation at time of delay

and to prevent:

- 'wait and see' approach to determining EOT;
- cost of formal dispute resolution;
- cost of establishing cause-effect nexus forensically; and
- disruption to operations/management

The protocol addresses the key issues of programme preparation and updating as well as the production of accurate progress records. These issues form the first 'core principle' relating to delay and compensation in the protocol entitled 'Programme and Records' (Society of Construction Law, 2002: para 1). This stipulates:

To reduce the number of disputes relating to delay, the contractor should prepare and the Contract Administrator (CA) should accept a properly prepared programme showing the manner and sequence in which the contractor plans to carry out the works. The programme should be updated to record actual progress and any extensions of time (EOTs) granted. If this is done, then the programme can be used as a tool for managing change, determining EOTs and periods of time for which compensation may be due. Contracting parties should also reach a clear agreement on the type of records that should be kept.

SCL recommendations: programme updates

The protocol suggests that the programme is a dynamic document that needs to be updated according to actual progress to enable proper monitoring of the project. The protocol further recommends that getting an approved programme and keeping it up to date is so important that any disputes in relation either to approval or to updating should be referred to adjudication or whatever dispute resolution procedure is available in the contract. It should be added that the updating of the programme to reflect actual progress does not mean that there is any admission of fault by either side for any delay. But ensuring such transparency will require a significant alteration in mindsets (Klein, 2002).

Regarding programme information, the protocol (Society of Construction Law, 2002: para 2.2) specifically states: 'As early as possible in the project, the contractor should submit and the CA should accept a programme (using commercially available critical path method project planning software) showing the manner and sequence in which the contractor plans to carry out the works.'

The SCL protocol (Society of Construction Law, 2002: para 2.2.1.5) also suggests that the programme should be updated on a regular basis to provide good contemporaneous evidence of what happened on the project, in case of dispute.

SCL recommendations: progress records

The protocol makes two key points regarding records (Society of Construction Law, 2002: para 2.2.1.2):

- (1) Records are required to show what work was carried out and when; and
- (2) the contractor and employer should agree what records are to be kept.

While such an approach if implemented would undoubtedly afford significant benefits to the employer, it will clearly require a level of rigour that is unusual with regard to normal project change management practices. Indeed this recommended approach has been criticized by some as placing too much of an administrative burden on the parties in terms of programming and record-keeping, which will inexorably increase construction costs (Henchie, 2002). Contractors are under considerable pressure to minimize their profit margins and it is sensible to assume that any additional obligations that require extra resources and for which there are no immediate benefits to the contractor will to some extent be opposed. However, these potential barriers also exist in the US, yet contractors on many projects are very careful to provide contemporaneous documentation and programme updates.

The US compared to the UK approach

As this paper suggests, much of the recommendations are similar to established practice in the USA, and while the SCL protocol provides well founded and sensible advice, the extent to which this advice will be adopted in practice is less clear. In the US, recommended methods for claims management including procedures for proving progress records are more comprehensively written into the common forms of contract and are generally more widely accepted as a result. While the recommendations contained in the SCL protocol regarding programme updates and progress record provision are sensible, its success will depend upon the extent to which the main bodies for the standard contracts adopt its principles. Currently the Institution of Civil Engineers (ICE) and the Joint Contracts Tribunal (JCT) do not include the recommendations in their standard forms.

One could argue that the principles adopted in the protocol are not completely new. The SCL's guidelines for evaluating time extensions during the course of a project are analogous to the Corps of Engineers' 'Modification Impact Evaluation Guide' which was published as far back as July 1979. Certainly many of the principles adopted in the protocol are akin to accepted principles in US Construction Law (Nash, 2002). For example, under US law an updated CPM programme must be used to prove entitlement to an EOT, and this principle has been adopted in the protocol. The protocol also adopts the US principle

that requires the employer to grant a justifiable EOT in a timely manner.

In response to a sharp increase in litigation in the construction industry in the early 1970s, in the United States public works lawyers developed contractual mechanisms to facilitate the analysis of delay and disruption that was frequently being experienced on projects. The aim of these mechanisms was to 'minimize expensive and time consuming disputes as to a contractor's entitlement to extensions of time and additional payments for disrupted working' (Davies-Evans and Harvey, 2003).

The US approach to project management would generally seem to place a greater emphasis on the importance of scheduling and change management than is the norm in the UK – and most other construction markets, for that matter. For many years undertaking construction work for the US government, for example the United States Agency for International Development (USAID) and the military, has required a level of scheduling and record-keeping rigour beyond what is widespread in the international contracting community.

This requires considerable resources on the part of the contractor regarding both time and money and may be viewed by some as onerous. However, it is strictly enforced by the government agencies with stringent scheduling specifications and rigorous project documentation requirements. Provisions have been added to many US construction contracts for public works that require the contractor to provide pre-determined scheduling documentation at specified intervals throughout the duration of a project. The primary purpose of these provisions is to provide the owner with appropriate and contemporaneous documentation in the event that a dispute involving a delay and/or disruption claim occurs.

These requirements have filtered down to commercial entities that are following the US government's lead, meaning that even contractors who are not undertaking public works are aware of the required methods. The greater level of experience regarding formal procedures for dealing with delay and disruption has created important legal precedents as to the proof required for a contractor to demonstrate delay and disruption.

Drivers for improved record keeping

The practical influence of such provisions is dependent on the extent to which they are implemented and enforced. In the US there would seem to be greater clarity regarding what is expected of the contractor, and therefore it is perhaps easier to penalize the contractor if he fails to conform to clearly defined requirements. In

Table 1 Requirements of US and Commonwealth contract forms

Requirements and/or recommendations	UFGS	AIA	FIDIC4	SCL
Baseline programme	✓	✓	✓	✓
Periodic updates (period specified)	✓		✓	✓
Scheduling software specified	✓			
Resource and cost loading per activity (labour and equipment)	✓			✓
Progress payment tied to schedule updates	✓			
Report logic changes for each update	✓			✓
Time impact analysis (TIA) used for time extensions	✓			✓
Designate scheduler with resume (payments not processed until acceptable person)	✓			
Activity coding	✓			
Limited activity duration	✓			✓

the US the consequences for non-conformance can be harsh. For example, not only may a contractor be denied interim progress payments if it does not provide the specified documentation timeously; a contractor who has failed to supply the specified documentation in accordance with the contractual provisions may be deemed to have failed to demonstrate an otherwise valid entitlement to an extension of time or additional payment. It is a different matter, however, if these requirements are not clearly defined, as is more the case in the UK. Table 1 illustrates this point by comparing the contractual requirements of the Unified Facilities Guide Specifications (UFGS) contract used on US military contracts with the Conditions of Contract for Construction contract form of the Fédération Internationale Des Ingenieurs-Conseils (FIDIC) and the SCL protocol recommendations. The UFGS is a result of collaboration between the US Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC) and the Air Force Civil Engineer Support Agency (AFCESA). The UFGS is used whenever the US military agrees construction contracts.

A notable point about the UFGS requirements is that progress payments are dependent on programme updates. The basis for payment is the actual progress made against the percentage complete value of the activity. If the programme is not updated, the contractor will not receive progress payments. Obviously this makes the efficient updating of the programme an extremely important process and is carefully monitored and updated by all parties to the contract. In many cases the employer and the contractor will employ a programming consultant to monitor the programme on an ongoing basis.

UK and Commonwealth: common contracts

As can be seen from Table 2, the basic standard contracts make little reference to the level of detail

required within a programme. The common forms of contract that require a programme to be produced do stipulate a variety of conditions under which the programme should be updated. These are detailed in Table 2.

In the new FIDIC form of contract from 1999 onwards, programme requirements have become more rigorous, requiring the engineer to comment by notice if the programme does not comply with the contract within 21 days. The contractor must also submit a revised programme whenever the previous programme is inconsistent with actual progress. The contract sets out the basic information to be included in the programme which should now be resourced.

Implications for successful record keeping

Many delay claims have been unsuccessful directly because there was a lack of accurate records produced contemporaneously at the time of the delay. Bramble and Callahan (2000) summarize the case of *Bath Iron Works Corp v United States (1995)* in which the contractor failed to maintain a claims management system. It therefore was unable to effectively collect any additional performance costs from disputed change orders and had no way of verifying that estimates (derived from random sample analysis) were accurate, complete and probative of any operative issues. The court rejected the contractor's claims.

The principle of how important it is for a contractor to keep contemporaneous records is further illustrated in *Bechtel National Inc (1990)*. Here the contractor's claims for delay and disruption were denied because the contractor 'did not maintain project logs or diaries and did not produce documentation that substantiates the extent of the cumulative impact claimed'.

The consistency with which claim documentation has been produced is also of great importance. In *Circle, Inc*, the Board of Contract Appeals drew an inference that there was no differing site condition from the

Table 2 Contractual requirements for programme updates in common contract forms

Contract requirements	GC/Works1 & 98	NEC	ICE 6/7 6DB	MW	NEC2	FIDIC 4 M&E87	DB95	MTC 89	JCT 80&98	FIDIC/ Build 98
Baseline programme required	✓	✓	✓		✓	✓			✓	✓
Periodic updates (as contract)		✓	✓		✓	✓				
Periodic updates (contractors discretion)	✓	✓	✓		✓	✓				
Update programme when instructed by CA if behind programme			✓		✓	✓				✓
Update programme only when an EOT granted									✓	
Update programme only if there is a variation								✓		
Update programme when CA gives notice that programme is inconsistent with contract or actual progress			✓		✓	✓				✓

contractor’s failure to document actual site conditions in one area in the same manner that it documented site conditions in another area (Bramble and Callahan, 2000: 8–19). In *Lucerne Construction Corp*, the board noted the contractor’s total failure to document the delays, even in simple daily logs, was almost inexcusable.

There is clear precedent regarding failure to adequately keep and provide such records, as is determined in *Falkland Islands v Gordon Forbes Construction*, para 11, which was under the FIDIC 4 contract, in which acting judge Sanders states:

It is argued by the Applicant that the intention of Clause 53 is to provide a disciplined way of dealing with claims for additional payment. Such is the overall clarity of Clause 53 that it would be hard not to agree with this proposition. Sub-clauses 53.1 to 53.3 set out a clear and ordered way of dealing with any claim for an additional payment: claims have to be notified at the time they arise, contemporary records have to be kept and regular accounts rendered. The whole contractual system is aimed at the early resolution of any queries at the time the claim arises, and with the strong likelihood that plant, manpower, experts and witnesses are still on site. It is designed to avoid prolonged disputes.

The case also addressed a very important issue and one that in the authors’ experience occurs on a regular basis: that of a party who when bringing a claim fails to provide contemporary records but then produces records in support of the claim at a later date. Regarding non-compliance of Clause 53, Sanders states the following:

It would be perverse, I believe, if a contractor who fails to comply with the terms of the contract should then be allowed to introduce non-contemporary records (this is to say a document which is neither a record nor a contemporary

document) to support a claim, particularly as this cannot be properly investigated by the employer. ... The rights of the employer to inspect the records at the time the claim arises, to conduct his own investigation as to the veracity of the claim with others on site, and to challenge the extent of the claim at the time the claim arises are fundamental to the FIDIC procedure. A contractor who fails to meet his contractual obligations cannot put himself in a better position by so doing, and must accept the consequential detriment as a result if he fails to keep comprehensive contemporary records. (Falkland Islands v Gordon Forbes Construction: para 29)

Sanders determined in his judgment that ‘Where there is no contemporary record to support a claim, then the claim fails’ (*Falkland Islands v Gordon Forbes Construction*: para 33(8)). This is pertinent to both the failure in providing programme updates and also to the frequent instances when claims for alleged delays are not evidenced with other contemporary records such as progress reports. However, while precedent exists for some contract forms and there is a good deal of pressure for parties to rigorously implement record-keeping and updating procedures in US public contracts, in the UK such procedures are considerably less enforceable due to a lack of specific contract requirements. Generally, therefore, in the UK it is left far more to managers to implement claims or change management systems that adopt the recommended principles of, for example, the SCL protocol and to add such clauses to the contract if deemed to be required.

Discussion

As discussed, there is a significant difference between the US and the UK regarding the rigour with which parties

document and record project progress, largely due to the lack of contractual requirement in UK-based projects. The principal problem is that many records are difficult to relate to a specific delaying event and are often not related directly to the master programme and rarely to activities within it. Figure 1 describes a widespread approach for dealing with change events which in the authors' experience commonly occurs on construction projects.

The model suggests that project records are frequently kept as part of a *general project archive*, which might be made up of a number of different types of record such as site diaries (SD in Figure 1), progress records (PR), meeting minutes (MM), drawings (D), variation orders and instructions (VO) and other general correspondence (GC). As the project

progresses (represented by the black arrow in the diagram) these records are continually added into this general archive incorporating tender and contract documentation which may be critical to the resolution of disputes arising later in the project. On many projects this archive is fragmented and disparate and project records exist in different offices, scattered across the entire project organization. It is becoming more common for some form of electronic system to be used, especially for drawing and document management, which makes it easier to access files (but does not necessarily mean they are ordered, cross-referenced or managed any more effectively).

At some point in time as the project continues, the occurrence of some form of change event is almost

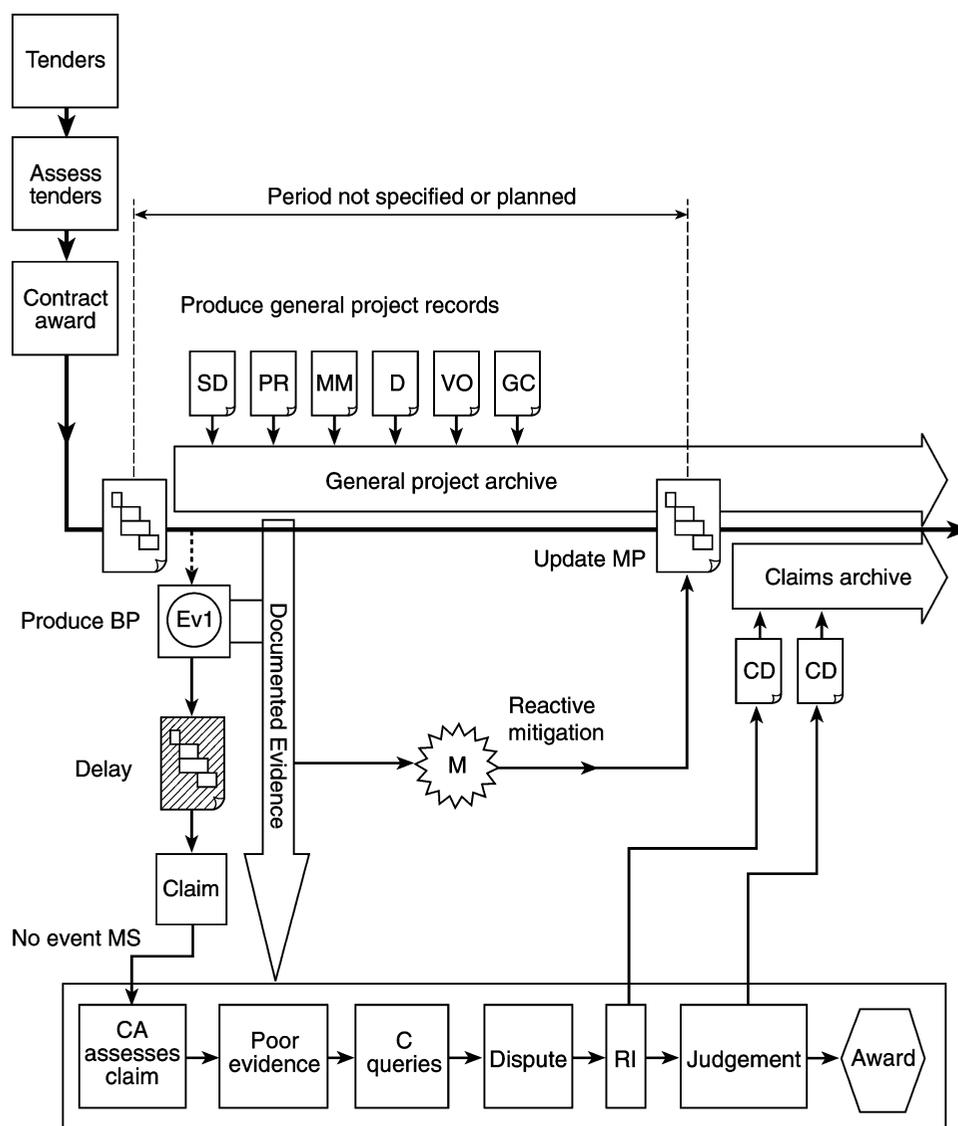


Figure 1 Common process for dealing with project change events (EV1: change event 1; MS: management system; CA: contract administrator; BP: baseline programme; MP: master programme; M: mitigation; C: claimant; RI: retrospective investigation; CD: claims documentation)

inevitable (Ev1 in Figure 1). Once a change event has been notified by the contractor or identified by the employer, there are a range of different ways in which it will be dealt with by management. Normally some form of assessment is undertaken regarding the potential for cost increases resulting from the change, but rarely will effects on the project programme be considered or the programme be formally updated. Frequently the specifics of the change event are not recorded at the time and the project progresses until slippage in the programme manifests itself. At this point, if the contractor believes he has been subjected to some form of employer delay, he will submit a request for an extension of time using evidence based on progress information contained in the general project archive. Some of this information will have been submitted to the engineer/employer and some will not have been. The contractor administrator (the engineer in this example) will then attempt to make an assessment of the change event to determine if any EOT is deserved. And this can be where the problem starts. If none of the records in the general project archive have been directly related to the change event, the engineer must undertake an often complex assessment to determine cause and effect, in a relatively short period of time (time period being determined by the contract) in order to check the contractor's claim. Frequently the limited records available make an accurate assessment difficult, which leaves the door open for the contractor to quite legitimately question the engineer's analysis as lacking the conclusive evidence on which to reach an unequivocal decision.

A separate process of investigating the event retrospectively then arises, often involving additional resources such as external consultants, and which frequently leads to arbitration and even litigation. Meanwhile the project continues to progress and other change events occur with similar results, which can lead to numerous disparate disputes on events being dealt with at the same time. This can seriously hinder any attempts to mitigate delays due to the team not being able to accurately assess the impact of concurrent or parallel delays occurring on the project. This in itself is rarely a simple task as there are many differing approaches to assessing concurrent delay claims (Martin, 2002). Mitigation strategies are therefore often limited due to their reacting to specific events in isolation. Even if all these disputes are resolved through mediation, the time and resource expended in obtaining agreement can be monumental. It is also interesting to note that so often the point at which reliable information regarding a specific change event is collated, documented and filed properly (in what we term here as a 'claims archive') is when the initial

process of investigating a claim by the contract administrator at a project level is complete.

Simply put, a lack of method or procedure for dealing with project change events before the start of the project (whether this is contained within a claims management system or a change management system) will frequently result in a haphazard and disparate method of dealing with claims for delay and disruption.

Figure 2 presents a model which describes a possible solution to the scenario described in Figure 1. The first difference between this and Figure 1 is that an *event management strategy* is established at the front end of the project. (Components of the event management strategy are indicated on Figure 2 with boxes containing bold text). This can be based on an approach similar to the UFGS, or can adopt recommendations from the SCL protocol. The event management strategy needs to be agreed as soon as possible after the main contract has been awarded (or before if possible, for example under a partnering or framework agreement) and needs to contain an agreed method statement which should be used to produce the initial baseline programme. Documentation that is produced in the general project archive should be structured using the method statement rules (for example progress record activities should relate to activities on the construction programme and template forms can be used to standardize and structure records). This will enable better quality records to be produced throughout the project, which in turn will enable a more efficient and accurate analysis of the cause and effect of specific delaying events to be undertaken as and when they occur. As Figure 2 illustrates, a delay claim can occur at any point in the project. By structuring general project records better and recording change events as they occur throughout the project in the event archive, the process of resolving a claim for delay or disruption should be made considerably more efficient and considerably less arduous for the contract administrator.

A more detailed description of the components required of an effective front-end event management strategy is provided below. This describes the elements that should be considered in the front-end strategy. It is not meant to be exclusive. Principles are adopted from best practice guidance such as the UFGS, the SCL protocol and the PFE Change Management Supplement (Pickavance Fenwick Elliott, 2003).

Components of the event management strategy

Baseline programme

A realistic baseline is required for any analysis that establishes a starting point for the work and illustrates

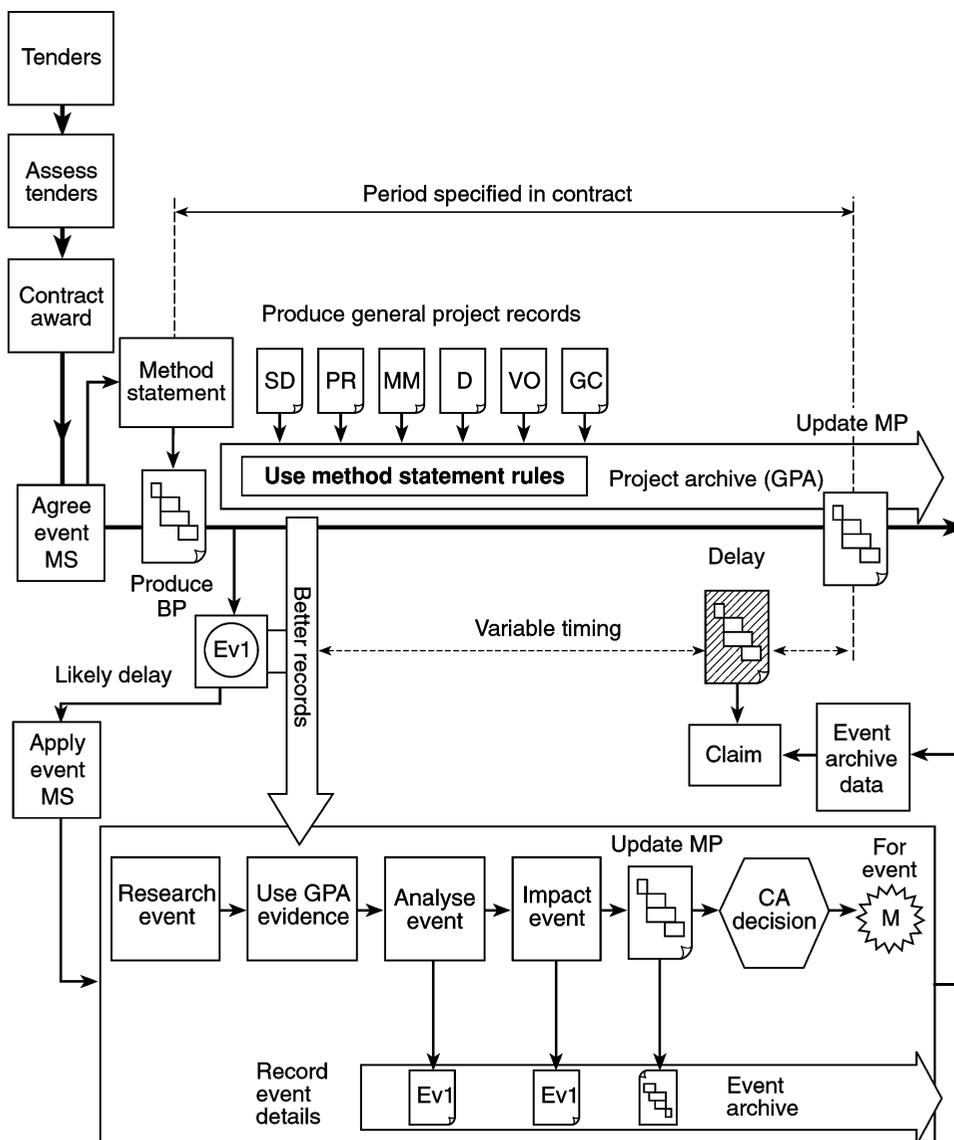


Figure 2 Proposed process for dealing with project change events (Ev1: change event 1; MS: management strategy; CA: contract administrator; BP: baseline programme; MP: master programme; M: mitigation; GPA: general project archive)

the contractor’s intent at the time. (It should be based on realistic durations and logic as to when the contractor intended to perform each phase of the work).

Adopt good practice in structuring the programme

This should be embodied in the contractor’s method statement, a description of the activities, durations, sequence and resources in accordance with the contractor’s critical path network. See SCL Protocol (Society of Construction Law, 2002) and PFE Change Management Supplement (Pickavance Fenwick Elliott, 2003).

Periodic updates

The update period needs to be specified and it needs to be agreed that in the event of a departure from the master programme the contractor will provide a revised programme. The logic changes for each update also need to be reported.

Scheduling software specified

In order to overcome issues of incompatibility it is prudent to agree the type of software to be used for programming.

Resource and cost loading

Many programmes do not include such information as resource and cost loading per activity (labour and equipment). However if this is undertaken rigorously it can provide valuable information to the mitigation process for any disruption caused and in assessing prolongation claims.

Progress payment tied to schedule updates

In the US progress payments are often tied to schedule updates, which acts as a great incentive for contractors to provide up-to-date information. However, in the UK there are some potential barriers to this.

Time impact analysis (TIA) used for time extensions

If the event management system is used effectively, the progress and programme information required for effective time impact analysis (TIA) will be in place. TIA is widely viewed as being the most rigorous form of analysis but requires good quality progress records.

Agree time periods for updates and analysis

The frequency with which the programmes need to be updated as a minimum (i.e. if no change events occur), and also how quickly particular assessments and decisions need to be made, should be agreed.

Selection of programming personnel

The role of the scheduler has even greater importance when utilizing a change management approach and the selection of a properly skilled individual or team is critical.

Determine how float will be handled

There is a lot of advice on how float should be handled. Ideally this should be agreed between parties. If not, a recommended approach (for example, the SCL's) should be adopted.

Recording an event

As has been discussed, this is critical. The aim is to create and agree a uniform approach to record-keeping at the front end that enables specific information relating to an event to be identified and entered into the event archive for immediate use or future reference. These event specific records need to then be accurately interpolated into network information for impacting on the current programme, which is often undertaken through the use of logic-linked fragnets. Careful consideration of activity coding should be given to enable specific events to be identified on the programme.

Recording progress

Assuming event records are well recorded, the thoroughness with which the progress records are produced

will directly affect the diligence with which the programme is updated. As a result, this will determine the accuracy of any analysis undertaken using this updated programme. Therefore the manner with which this progress information is structured must be compatible with the structure of the programme itself regarding the planned activities. (In the approach described by Figure 2, this information will be contained in the method statement). It will for example be far less useful to record the progress of all the concrete floor slabs in a car park collectively as one activity ('car park floor slabs') if each floor slab is represented by a separate activity on the programme.

Penalties

Determine if any penalties (such as liquidated damages) will be incurred for non-compliance with the front-end event management strategy and of specific criteria contained within.

The principles contained in the front-end event management strategy could be included as a contract supplement or be a non-contractual agreement established by the parties. This will very much depend on the project and the relationship between the relevant organizations. For example, on a longer-term project with partnering arrangements in place, an agreed method statement might suffice. On other projects, a more contractually binding approach may be required. The most important aspect is to obtain as much voluntary agreement from the parties as possible at the project's front end. An important aspect to ensure established is a method of capturing progress that can be related in some form directly to the activities on the construction programme. This will make the process of impacting and updating the programme far more simple and accurate than if general progress records reporting on different level activities (which are more or less detailed than those contained on the programme) have to be used. Figure 2 addresses this by recommending a method statement is established prior to the production of the baseline programme.

From this a clear method of capturing the required information arising from a specific change event can be established. Figure 2 shows that once this has been implemented the occurrence of a change event can be dealt with immediately to determine its likely impact on the programme. The aim here is to log the change event in an event archive which records the cause of the event and if possible the likely effect of the event on the programme (denoted by 'Update MP' in Figure 2). The employer should also record the intended mitigation of any delays occurring from the event. This will capture the intent of project management at the time the event occurred, which is normally very difficult to

identify when undertaking retrospective analysis. While it is sometimes difficult to predict accurately the effect of a specific event, the process of capturing event specific records in the event archive will enable the engineer to determine more quickly and accurately any entitlement for EOT or prolongation once a request has been submitted by the contractor. Such an assessment will be based on a greater amount of factual evidence than is often the case and there is a far greater chance that agreement will be made earlier in the process rather than pursuing the claim through arbitration or litigation because the evidence (if recorded correctly) will be unequivocal.

Of course, there is a balance to this allocation of resources which could be described as cost now or cost later. The team do not want to be burdened with time-consuming obligations to prepare countless documents that may not be required if a claim does not arise. However, due to the fact that many construction claims are for EOT or prolongation costs, this is unlikely, especially on projects of any scale or complexity. It is further proposed that the process of populating the event archive is more an issue to establishing a method and ensuring all relevant parties provide the information in the agreed format rather than undertaking any unnecessary tasks. Another important factor in establishing such a system is that the ability to undertake accurate 'what if' scenarios is enhanced if the team are working with up-to-date programme and progress information. This provides the team with far more accurate and reliable information with which to develop mitigation strategies and to make decisions at the time an event occurs. Therefore such an approach facilitates effective project management and is not simply restricted to being a claims management system.

Generally therefore the proposed process model for dealing with change events presented in Figure 2 differs from the common process described by Figure 1 in that it has the following attributes:

- (1) An *event management strategy* is agreed at the project front end which contains core principles for producing and managing project records, including recommended practice for producing and updating project programmes;
- (2) The information recorded in the *general project archive* is compiled adhering to a common format in accordance with the method statement and front-end event management strategy;
- (3) Once a change event occurs, records are reviewed and further analysis of a specific event is documented in the *event archive*, where matters relating to cause and effect are recorded;

- (4) Initial analysis of events regarding delay and disruption can be undertaken more quickly due to information in the general project archive being more associated with the project programme and planned activities;
- (5) All information pertaining to the analysis of delay and disruption claims is recorded in an event archive, which assists the team in recording event-specific information for immediate or subsequent use in determining EOT or prolongation claims.

Conclusion

It is clear that common problems associated with the production of project records in the UK may be expedited through implementation of the SCL protocol recommendations for procedures to help project teams deal with delay and disruption.

The US currently has more rigorous and onerous procedures regarding the production and maintenance of project records, especially on public contracts. However, certain barriers exist that might prevent such an approach being adopted in the UK, notably public sector clients' disinclination to implement such record-keeping as a contractual requirement.

While in the UK parties are not obliged to produce the same degree of rigour when documenting project change events or when recording project progress, it is nonetheless imperative that they carefully establish methods and procedures for dealing with such events at the project front end. The implementation of such a strategy within 'claims management' or 'change management' systems will avoid unnecessary and costly investigations and will mitigate, where possible, legal disputes for client organizations.

Figure 1 describes the common process for dealing with project change events and illustrates how conventional methods of record-keeping can make assessing the extent of delay and disruption complicated and time consuming. Figure 2 suggests an approach which overcomes these problems and which contains an event management strategy and event archive. By following the principles required to establish and implement a front-end event management strategy as described in Figure 2 and by establishing and maintaining an event archive, the cause and effect of events can be analysed more accurately and more efficiently. Such an approach will reduce the amount of resource expended on the assessment of change events when determining delay and disruption entitlement and culpability and will enable more effective and responsive mitigation strategies to be made before the negative impacts of a change

event can fully manifest themselves. It will also enable disputing parties to agree cause and effect on unequivocal evidence at a much earlier stage, thereby reducing the likelihood of parties having to pursue the dispute through arbitration or litigation.

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