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# **THE EVALUATION OF TIME CLAIMS IN CONSTRUCTION PROJECTS**

by

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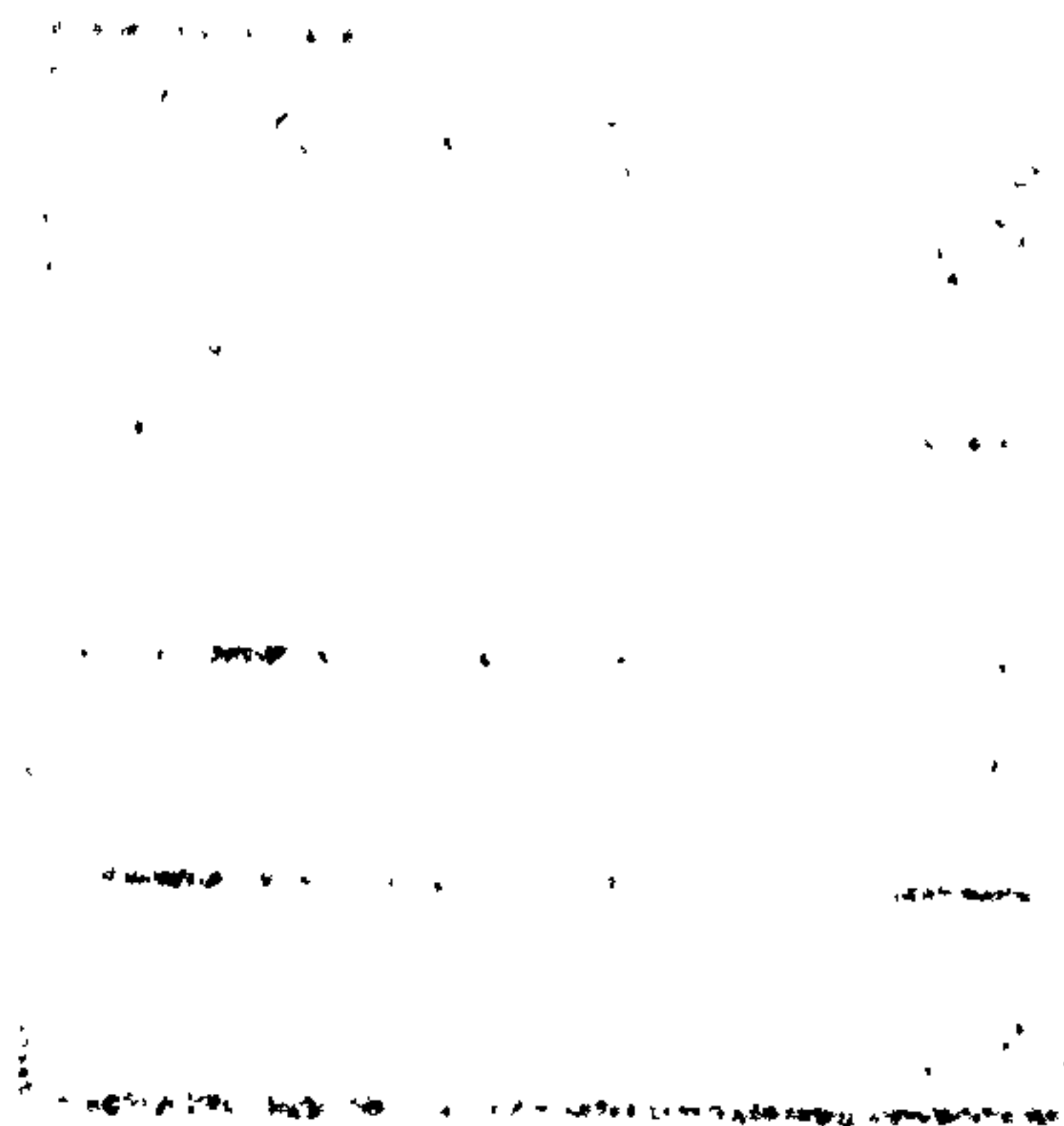
Ph. D.

A Doctoral Thesis submitted in partial fulfilment

of the requirements for the award of

Doctor of Philosophy of Loughborough University

February 2000  
(Corrected September 2001)



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## Glossary

**Activity:** An element of work. In planning construction projects the work is broken down into manageable sized elements or activities. Activities are graphically represented on Bar or Gantt charts by individual bars showing, against the time scale on the chart, the start and finish dates of the work. Alternatively milestones on such charts graphically depict the start or completion of an activity or series of activities. Activities on network diagrams will be graphically represented by start and finish events or nodes.

**Activity Dates:** There are a number of dates commonly used as part of a network analysis:

**Early Start Date:** The earliest date an activity can begin, based on the durations of preceding activities;

**Late Start Date:** The latest date projected for the beginning of an activity, based on its duration and the durations of succeeding activities;

**Early Finish Date:** The earliest possible completion date for an activity, based on its duration and the durations of preceding activities;

**Late Finish Date.** The latest date an activity can be completed, based on its duration and the durations of succeeding activities.

**Analyst:** The professional appointed to analyse time related matters. (see also: Time Analysis). There is no common background to those currently practising in this field.

**Artificial Intelligence:** The use of computer simulation techniques for problem solving.

## **Glossary**

**As-Achievable Programme:** A programme prepared to demonstrate the time period within which a project could reasonably have been constructed. The As-Achievable Programme will identify each activity and show the sequence of work.

**As-Built Programme:** A programme prepared to demonstrate the time period during which a project was, in the event, constructed. The As-Built Programme will identify each activity and show the sequence of work.

**As-Impacted Programme:** Two versions of the As-Impacted Programme are usually produced:

**The As-Impacted - Employer Responsible Programme:** will incorporate those delaying events which are the responsibility of the employer.

**The As-Impacted - Contractor Responsible Programme:** will incorporate those delaying events which are the responsibility of the contractor.

**Baseline:** A programme against which delay can be measured. May be the As-Achievable Programme.

**BLR:** Building Law Reports published by Longman.

**But-For:** A legal concept used largely in causation, viz: but-for the rain, I would have been able to play cricket. It is used to describe a potential result which would have been achieved had one of one or more causative events not occurred. A 'But For' analysis is one which seeks to establish the position the contractor, for example, would have been in 'But For' the default of the employer.



## **Glossary**

**Causation:** A legal concept. It is the expression used to describe the connection between an act, omission or default and its consequence.

**Completion Date:** The date for the completion of The Works. Usually referred to in construction contracts as Practical Completion being the date when the work is sufficiently complete for the employer to take possession, but before defects are made good. Alternatively any revised date set as a result of the granting of an extension of time. See also Date for Completion.

**Computer Scheduling Techniques:** The use of computer software packages for producing programmes, histograms and for time planning. The most sophisticated packages include, for example, ARTEMIS, PRIMAVERA and OPENPLAN. The more popular packages include, for example, POWERPROJECT, and MICROSOFT PROJECT.

**Concurrency:** Concurrency is said to exist where a particular delay is being caused by more than one event.

**Construction Industry:** For the purposes of this work the Construction Industry includes work of Building Construction, Civil Engineering, Process Engineering and Petrochemical Engineering. Includes all parties engaged in this work from suppliers, fabricators, professionals etc.

**Construction Management:** A form of contracting where a contractor manages construction work for a fee. All trade contracts are direct between trade contractor and employer. (Compare: Management Contracting)

**Contemporaneous Pricing:** Particular term used in Causal Analysis. Analysis of delay using the actual performance data relevant at the date when the delay occurred. The balance of the performance is analysed on a prospective basis.

## **Glossary**

**Construction Period:** The time allowed for the completion of construction work on site. Usually the period between the Date for Commencement and the Completion Date. See also contract period.

**Contract Period:** The time allowed for the completion of construction work on site. Usually the period between the Date for Commencement and the Completion Date. See also construction period.

**Critical Path:** The shortest path through the project comprising activities with zero float. If a delay occurs to any of those activities the project as a whole would be delayed. Sequential route from the start to the end of a project through all activities with zero float. See also Float.

**Critical Path Analysis (CPA):** A programme where the activities are linked by logic constraints which identifies the critical path through the project. The analysis will determine the amount of float on all activities. The critical path will be identified through the activities which have zero float.

**Critical Path Method (CPM):** The technique of producing a Critical Path Analysis. May also be used to refer to a Critical Path Analysis.

**Critical Path Network (CPN):** A graphical depiction of a Critical Path Analysis showing logic constraints and dependencies and identifying the critical path through the project. May also refer to the data stored as part of a Critical Path Analysis. May also be used to refer to a Critical Path Analysis.

**Data Listing:** A report produced by Computer scheduling software from the data comprising a network. Typically includes activity dates ie. late and early start and finish dates, activity description, duration and float, actual start and finish dates and percentage complete for activities in progress. Most software packages allow the user to define the content and layout of such reports.

## **Glossary**

**Date for Completion:** The date set in the construction contract for the completion of the Works. Alternatively any revised date set as a result of the granting of an extension of time. See also Completion Date.

**Delay:** A failure to commence, progress or complete a project, task or activity by the planned time.

**Delay Analysis:** The analysis and identification of delays to a construction project.

**Design and Build:** A form of contracting where the contractor accepts responsibility in part or in full for the design of the project.

**Duration:** Period of time. The time required to complete an individual activity.

**Event:** In networks activities are described by reference to start and finish events. Matters causing delay are also often referred to as events and in particular the JCT contracts refer to relevant events as being events which give rise to an entitlement to an extension of time.

**Excusable Compensable Delay:** Delay for which the contractor is entitled to an extension of time and to compensation in respect of that delay.

**Excusable Non-Compensable Delay:** Delay for which the contractor is entitled to an extension of time but is not entitled to compensation in respect of that delay.



## **Glossary**

**Float:** Float can be defined in two ways

- (a) **Free Float:** The amount of time an activity can be delayed without delaying any subsequent activity;
- (b) **Total Float:** The amount of time an activity can be delayed without delaying project completion.

It is conceptually possible for activities to have positive or negative float. Negative float is generated when there is an imposed completion date which is earlier than the calculated completion date. See also Activity Dates and Critical Path.

**Fragnet:** A network of part of a project. May be a sub-network.

**Further and Better Particulars:** Term peculiar to English-based legal systems. A legal document elaborating on, or detailing a written legal argument. Usually used during the process of pleading claims. See also particularisation. If a party believes that the case that it is being asked to answer is insufficiently particularised it may seek Further and Better Particulars.

**Global Claims:** Claims in which a number of complaints are said to contribute to a single loss. See also Rolled-Up Claims.

**Government, The:** Much of the work carried out in the US is for the Government as Employer. Many US publications refer to the Employer as The Government. That expression is used in this work and should be read as Employer.

**Hindsight Pricing:** Term peculiar to causal analysis. Analysis of delay using the actual performance data.



## Glossary

**ICC:** International Chamber of Commerce, International Court of Arbitration, based at 38 Cours Albert 1<sup>er</sup>, 75008 Paris, France.

**ICE:** Institution of Civil Engineers, based at 1 -7 Great George Street, London, SW1P 3AA.

**Impact Analysis:** The identification and analysis of delays, and causes of delay, to a construction project.

**Implied Terms:** A legal concept. Terms may, in certain circumstances, be implied into a contract where none are expressly stated.

**Logic:** The constraints imposed as between the various activities required to achieve the completed project.

**Manloading:** The calculation of the number of men required to achieve a particular plan of work. Expressed in Man-hours, Man-days, etc. Usually represented in the form of a histogram or graph.

**Management Contracting:** A form of contracting where a contractor manages and builds a construction project for a fee and where all trade contracts are between the trade contractor and management contractor. (Compare: Construction Management).

**Method Statement:** A schedule produced by the contractor setting out his proposed method of constructing the Works. The schedule should detail each element of work or operation, setting out the principal quantities, special considerations, the labour plant and equipment required and the method to be adopted.

**Modification:** The expression used in US contracts and case decisions to refer to a variation.

**Network Analysis:** The process of producing network programmes.

## **Glossary**

**Network Programme:** A programme where the activities are linked by logic constraints. See also Critical Path Analysis, Critical Path Method and Critical Path Network.

**Non-Excusable Delay:** A delay for which there is no entitlement for an extension of time.

**Particularisation:** A legal concept peculiar to the process of pleading claims. A party making a claim must set out ('particularise') its complaint in sufficient detail to allow the opposing party to know the case which it has to meet and to be able to make a proper response.

**Performance Data:** Used to calculate labour requirements. Used by planners to calculate activity durations and estimators to calculate rates for pricing. Will be important to identify differences between the planned production rates and those achieved in practice.

**PERT:** A form of network analysis which incorporates a degree of risk analysis. The initials stand for Performance Evaluation and Review Technique.

**Planning:** The task of producing a plan for the work. See also programming.

**Programming:** The task of producing a plan for the work. See also planning.

**Programme:** A plan for the work set out either as a bar chart or a network.

**Progress:** Achievement against the plan.

**Project Management:** The management of a project or projects. Usually refers to work undertaken by or directly for the Employer.

## **Glossary**

**Project Management Software:** Computer software packages used as a tool for planning and managing projects, Comprise principally the facilities for cost management and producing programmes. The most sophisticated packages include ARTEMIS, PRIMAVERA and OPENPLAN. The more popular packages include POWERPROJECT and MICROSOFT PROJECT.

**Project Status:** A measure of overall progress against the plan. May be expressed in terms of overall percentage complete as against planned or as a number of weeks ahead or behind programme.

**Prospective Pricing:** Term peculiar to causal analysis. Analysis of delay using the original plan.

**Relationships:** See also logic. Term used in planning to refer to and define constraints, logic between two or more activities.

**Relevant Event:** An expression used in the JCT forms of contract to describe an event or occurrence which gives rise to an entitlement to an extension of time. See for example Clause 25.2.1.1 of JCT 80.

**Resources:** Resources include plant, labour, technical and supervisory staff and materials as the context requires.

**Retrospective Delay Analysis:** Used in the UK in respect an analysis of delay carried out after project completion. See also retrospective pricing.

**Retrospective Pricing:** Term peculiar to causal analysis. Analysis of delay, using the actual performance data. See also hindsight pricing.

**Rolled-Up Claims:** Claims in which a number of complaints are said to contribute to a single loss. See also Global Claims.

**Schedule:** Term used in the US meaning programme or plan.



## **Glossary**

**Schedule Impact Analysis:** The analysis and identification of delays to a construction project. See also Impact Analysis.

**Scheduling Clauses:** Provisions within construction contracts requiring the production review and maintenance of programmes.

**Scott Schedule:** A schedule used in litigation which sets out the contentions of two parties side by side in columnar form.

**Sequence:** The flow of activities. A function of logic and relationships applied to the network.

**Sub-Network:** A network providing a breakdown of a single activity in a larger network. See also Fragnet.

**Time Analysis:** The analysis and identification of delays to a construction project. See also Impact Analysis.

**Time Entitlement:** The time allowed for completing the Works plus any additional time allowable in respect of a delay.

**Window:** A section of the project usually defined between two points in time. Used where the delaying event(s) apply to discrete time periods or in order to break a large project down into manageable sections.

## ABSTRACT

This thesis is concerned with the investigation of various aspects of the analysis of delay claims, including previous literature, problems of practical application and legal principles and jurisprudence. The research includes the analysis of material generated in the UK and also in the USA where the techniques of delay analysis are in common use and have reached a level of sophistication that has wide acceptance amongst practitioners. A secondary strand concerns the problems that affect construction works and the impact that those particular problems have on the process of delay analysis. The thesis proposes a process that will lead to the production of delay analyses and presentations that are clear, concise and have sound evidential value.

Little is recorded in respect of the way in which construction analysts approach delay analysis. By analysing details of particular construction disputes and the decisions in respect of construction disputes that have been the subject of litigation or arbitration a set of principles has been distilled. Problems of collecting and analysing data have been identified and details of the type of information that should be recorded and subsequently collated and presented have been established. This has been done by reference to the matters that have been identified as being necessary by those trying construction disputes and recorded in their decisions. No comparable work has been found which brings together the areas of theory, legal principles and the practical application as related to delay analysis in the construction industry.

The proposal has been reviewed by leading practitioners and construction lawyers and the responses were all supportive. The proposals have been implemented in industry, tested and adopted. The response from other practitioners and construction professionals has also been positive.

**Chapter 1 Introduction**

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## **1.1. Background**

**1.1.1. The construction industry, like most other major industries, has its own associated disputes resolution and litigation industry. This industry includes construction professionals, solicitors, barristers, accountants and others. There are companies, both single and multi-discipline, and divisions within companies, whose sole business is the evaluation, preparation, prosecution and resolution of construction industry disputes. Such disputes are mainly the result of either:**

- defects, caused by defective design and/or workmanship and/or materials; or,**
- delay, suspension, disruption and/or acceleration of the works and the consequential costs and/or losses.**

**Defects may relate to structure, components or finishes of a building. Poor quality and/or leaking brick cladding is quite a common problem, floor finishes and floor screeds often feature in defects claims in respect of building work. Failure of equipment and/or process may occur in respect of power and process engineering projects.**

**Delay, suspension, disruption and acceleration may affect individual activities or, potentially, the project as a whole. In particular, delay will either be activity delay or project delay. Project delays, delays which affect the completion date, are critical delays.**

**Defects, if apparent during the construction period, may cause delay, suspension or disruption. This may, in turn, lead to the need for acceleration.**

**Other disputes would include those arising from the sale or purchase of construction companies or companies who are undertaking construction work, termination and insurance and valuation related matters.**



- 1.1.2. Action in respect of such disputes occurs primarily between contractors and building owners and between contractors and sub-contractors. Subsequent action between owners and their consultants<sup>1</sup>, action in respect of the more modern methods of contracting, including Project Management, Construction Management, Management Contracting and Design and Build is now more likely to occur.

The reason why there is an increase in the number of cases concerning disputes between owners and their consultants is not entirely clear and further consideration is required, although at least one cause appears to be that employers are increasingly finding themselves left with unprofitable schemes and may take such action as a defence against claims for outstanding fees. It may also be that the increasing use of schedule impact analysis techniques has made owners more aware of the many delays which are caused by changes and variations required to overcome design errors, deficiencies and inefficiencies. With that awareness owners are turning to their consultants for compensation rather than the contractor.

- 1.1.3. There are many standard texts dealing with contractual relationships and remedies and other works dealing with construction project planning. When this work started in 1991 there was little or no published material dealing comprehensively and exclusively with the evaluation of the quantum of either cost or time in the context of construction related disputes in the UK. Since this work started Keane<sup>2</sup> has produced a doctoral thesis which proposes a systematic approach to the collection and analysis of data to produce a time analysis. A book has recently been written by Pickavance entitled Delay and Disruption in Construction Contracts<sup>3</sup>.

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<sup>1</sup> Including contractors and other organisations acting as construction managers.

<sup>2</sup> Keane P J, (1994) PhD Thesis 'A Computer-Aided Systematic Approach to Time Delay Analysis for Extension of Time Claims on Construction Projects'.

<sup>3</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts, LLP.



A doctoral thesis by Dr F. Mastrandrea will, it is anticipated, form the basis of a substantial work on the quantum of money claims. This present work is intended to deal with the quantum of time claims.

Such work as is available is, in the main, based upon US practice and case law. A substantial number of articles and decided cases are available from these sources.

- 1.1.4. In recent years there has been an increase in the use of computer technology in the analysis of data and presentation of claims. One particular use being the production of graphical presentations. It is one of the great advantages of modern computer software that it is possible to produce graphics which are quick and easy to read and create an immediate visual impact.

This research has, however, shown that many of these presentations, which are convincing on their face, can, on analysis, be found to be lacking in substance. This is particularly so in respect of presentations produced in support of time related claims. To achieve the clarity desirable such presentations are likely to be simple bar charts. These charts ought to be a summary of the more complex underlying analysis. They are, however, often found to have no underlying logic or analysis at all.

When presentations are based on some form of analysis these have been found to incorporate suspect assumptions regarding logic, activity duration, construction method and environmental factors and errors of fact and more particularly in their methodology. This is likely a major factor leading to the failure or heavy discounting of such claims. This matter will be considered further in this present work, although an apparently casual attitude towards planning within the construction industry may also be a significant factor.

- 1.1.5. There is little by way of UK case law which offers guidance with the

evaluation, presentation and proof of time claims. Such decisions as are available deal with time claims in the broadest way. This work will consider how the law in this area might develop.

In the UK, in the past few years, there has been a move towards the type of schedule impact analysis which is widely used and accepted in North America. None of those directly encountered in this research have been either convincing or prepared on the basis of the best available techniques or factual information. None have succeeded in gaining judicial acceptance, only one analysis reached a hearing. This was an ICC arbitration between Creighton International, an American construction company, and The Government of the State of Qatar. The Tribunal, in the event, chose to uphold an extension of time that had already been granted and passed no comment on the analysis presented by the expert for either party. More recently the decided case of **John Barker Construction**<sup>4</sup> approved a prospective form of Schedule Impact Analysis.

Time claims generally tend to be resolved by the crudest of methods. A large proportion of construction projects overrun their intended or extended contractual completion dates. The relevance of this to the current study is not entirely clear. It is likely, however, that:

- as contractors become aware of the effect of poor planning on their ability to pursue time claims they are likely to improve planning techniques;
- as data is collected demonstrating the events which are likely to cause delay more effort may be taken to avoid such problems or revise contract provisions to deal more effectively with them.

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<sup>4</sup> **John Barker Construction Limited v. Portman Hotel Limited** (1996) 12 Const L J 277 and (1996) CILL 1152.

1.1.6. Further consideration should be given to the need to analyse and understand the cause of such a high incidence of failure to meet the planned completion date. It seems likely, however, that the casual approach to planning referred to above will be found to be a significant factor. It is probable that in the majority of those projects that suffer delay the time entitlement and adjusted contract completion date will be established by a process of negotiation rather than by formal and detailed analysis. The parameters of such negotiations being set by the original and actual completion dates. Although in the US the concept of a theoretical time entitlement is frequently utilised<sup>5</sup>.

It is considered likely that, on the basis of the knowledge currently available to analysts, many time claims could be defeated or substantially discounted. Quite apart from technical and factual defences, there is currently a strong legal defence against claims for time related losses which do not adequately establish the amount of time to be properly allocated to each alleged breach or do not establish the impact of the alleged breach on the completion date. More recent cases have tended to restrict the ability of those defending time claims to deploy arguments relating to particularity through an attack on pleadings, but the basic requirements of proof remain unchanged. In considering how the law in this area might develop, consideration ought also be given to the way in which such cases are pleaded. Clearly relaxation of the requirements at the pleading stage does not avoid the ultimate need to provide clear and concise proof of the cause of delay.

1.1.7. In the US a process described as Schedule Impact Analysis has evolved. This is a process for analysing the time requirements<sup>6</sup> of a project in a structured way which explains deviations<sup>7</sup> between the original plan and

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<sup>5</sup> This is not a concept which has, thus far, found favour in the UK courts.

<sup>6</sup> The same analysis may also deal with acceleration and disruption.

<sup>7</sup> It is unlikely that a single analysis will explain all deviations. For evidential purposes it is necessary that an analysis should be balanced and objective. An analysis may, for purposes of clarity be restricted to critical delay. It is possible however that delay to non-critical activities or delay to areas of the project off the critical path may give rise to financial loss.



the time actually taken in fact and establishes time entitlement. Use of the term in the UK is now increasing although it tends to be used in a very loose way. The process may also be referred to as a Time Analysis or Delay Analysis. All these terms would fall within the general heading of Techniques for the Evaluation of Time Claims.

An initial review of the literature identified a paper entitled **The use of Critical Path Techniques in Contract Claims**<sup>8</sup>. This paper sets out a summary of the stage of development reached in 1974 in the USA<sup>9</sup>. By 1974 Schedule Impact Analysis using Computer Scheduling Techniques was a well established method of proving delay claims on construction projects. The method was also accepted by the US courts.

A subsequent paper in 1989 **Use of Critical Path Method Techniques in Contract Claims: Issues and Developments, 1974 to 1988**<sup>10</sup> reviewed the developments over that period.

The methods of Schedule Impact Analysis identified by these papers and used in the US are of interest because they appear to provide a range of solutions to the problems of resolving time claims. The methods are well understood by analysts, advocates, judges and arbitrators and are known to meet the required standard of proof to establish time entitlement. No such common approach or understanding of the required standard of proof is currently available in the UK.

The articles indicate that there existed in the US a large volume of cases

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<sup>8</sup> Wickwire Jon M and Smith Richard F, (1974) **The use of Critical Path Techniques in Contract Claims**, Article Public Contract Law Journal Vol 7 No 1, October, 1974.

<sup>9</sup> This paper was based on a methodology developed by A James Waldron in the late 1960's. At first the method was developed to assist contractors presenting claims and after some initial resistance eventually found favour. However when Waldron started to work for clients rather than contractors he realised that this method was, without proper safeguards, likely to produce results which were particularly favourable to the contractor. This led to the development of the method to attempt to balance out the theoretical approach and take account of contractor caused delay.

<sup>10</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) **Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988**, Article Public Contract Law Journal.

and other literature relating to this subject. Searches of UK sources of such information indicated that the subject was not considered in any depth in UK cases and other literature. It was however recognised that a large amount of information relating to the presentation and prosecution of delay claims in the UK was available in the archive of Northcrofts Management Services Ltd ('NMS'), which was directly available to the author.

1.1.8. The advantage of having clearly defined methods available is that they are recognised and understood by those involved in the process of claims resolution. Thus it is likely that time, effort and cost could be saved in the analysis and presentation of claims if a set of acceptable standard solutions or parameters were available to select from.

1.1.9. Although not essential Computer Scheduling Techniques are normally used to perform the Schedule Impact Analysis. This involves the construction of a computer model<sup>11</sup> (programme) of the project which can be adjusted to analyse, measure and illustrate the impact of delaying events.

Computer Scheduling Techniques is the term used to describe computer based project management software. There are at least 20 such software packages currently available. Some are more suitable than others for Schedule Impact Analysis.

## 1.2. Aims

To analyse the information relating to the way in which delay claims on construction projects are prepared and presented which is available in the US and UK and propose a suitable process for use in the UK.

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<sup>11</sup> There may be a number of models. At least there is likely to be the As-Planned and As-Built charts. There may also need to be separate models for different stages or time periods.

### 1.3. Objectives

The objectives of this research are to:

- analyse the current literature and decisions to identify the methods of analysis available and the legal principles that need to be satisfied;
- distil theoretical concepts from the information analysed in respect of methods of analysis available;
- analyse current practice against the theoretical concepts;
- compare theoretical concepts and current practice and identify areas where current practice does not meet the theoretical concepts;
- identify solutions to the problems encountered where current practice does fall short of the theoretical concepts; and
- develop a proposal for an approach to the preparation of delay claims which incorporates the legal principles and theoretical concepts and resolves the problems found in practice.

### 1.4. Hypothesis

It is the hypothesis of this thesis that:

*An effective approach to the analysis of delay claims which satisfies UK legal precedents and practical constraints can be identified by using US practice and legal precedents as a model.*

### 1.5. Methodology

- 1.5.1. The choice of Methodology will be influenced by a number of factors. The main influencing factors will be:



- The Aims, Objectives and Hypothesis of the Research;
- Nature of the Enquiry;
- The Data Required to Complete the Analysis;
- Material Available.

### **The Aims, Objectives and Hypothesis of the Research**

- 1.5.2. The Aims, Objectives and Hypothesis are set out in sections 1.2, 1.3 and 1.4 above.

### **Nature of the Enquiry**

- 1.5.3. The subject matter of this research is a specialised field within the construction industry.

The enquiry needs to establish how things are done in the US and explore what may be acceptable in the UK. In both jurisdictions it is necessary to establish what happens as a matter of practical application and what is required by the law.

### **Data Required**

- 1.5.4. In order to complete the research it is necessary to collect and analyse data which describes and details the approach to delay analysis currently in use in the UK and US and the current position of the law.

### **Material Available**

- 1.5.5. The initial literature review indicated that the material available can be categorised in five main groups:

- **Reports of UK Decisions:** The decisions<sup>12</sup> available in the UK are limited in both number and scope.
- **Reports of US Decisions:** There are a significant number of decisions which are relevant to the area of research.
- **UK Literature:** The number of books and articles is limited. Such material as is available in the UK is generally based on previous work in the US.
- **US Literature:** There is a significant amount of published material, including books and articles.
- **Records of Actual Disputes:** The UK decisions and literature are not considered to be adequate to provide a proper understanding of how delay claims are being presented in the UK and how that will affect the ability to develop. In order to obtain this data some further source is required.

NMS had available records in relation to about 60 actual disputes which have been subject of formal process over a period of 10 years. It was considered that the use of this material was likely to produce a more meaningful reflection of current practice in the UK than responses to a questionnaire.

The records of the disputes reflect the input of all the major construction Law Firms, Barristers and Delay Analysts. Given the sensitive and confidential nature of the material involved it is

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<sup>12</sup> Decisions are used to establish legal principles by way of precedent. The Lectric Law Library's Lexicon defines a precedent as *'Legal principle, created by a court decision, which provides an example or authority for judges deciding similar issues later. Generally, decisions of higher courts (within a particular system of courts) are mandatory precedent on lower courts within that system - that is, the principle announced by a higher court must be followed in later cases.'* In most courts the decisions are given in writing and are published and generally available. The published decisions are therefore an independent source of the law. Decisions are also referred to as Law Reports, Reports of Decided Cases, Case Law and sometimes simply as Cases.



considered to be unlikely that the views, opinions and advice of such individuals could be canvassed in a more comprehensive way. It is considered that the views, opinions and advice reflected in the records and therefore the study are better expressed and explained than they would be in response to a survey questionnaire.

### **The Structure of the Research**

1.5.6. From consideration of the aims, objectives and hypothesis and the main influencing factors discussed above, it can be concluded that the following areas of primary research and analysis are required:

- **UK Decisions:** Identify appropriate decisions and obtain copies of the reports, identify the relevant items of data required, review the decisions and extract relevant items of data, analyse the data and write up the results.
- **US Decisions:** Identify appropriate decisions and obtain copies of reports, identify the relevant items of data required, review the reports and extract relevant items of data, analyse the data and write up the results.
- **UK Literature:** It is necessary to identify and obtain copies of the appropriate material, identify the relevant items of data required, review the literature and extract relevant items of data, analyse the data and write up the results.
- **US Literature:** It is necessary to identify and obtain copies of the appropriate material, identify the relevant items of data required, review the literature and extract relevant items of data, analyse the data and write up the results.
- **Records of actual disputes:** Identify the key items of data required, interrogate the records and record relevant data, analyse the data and

write up the results.

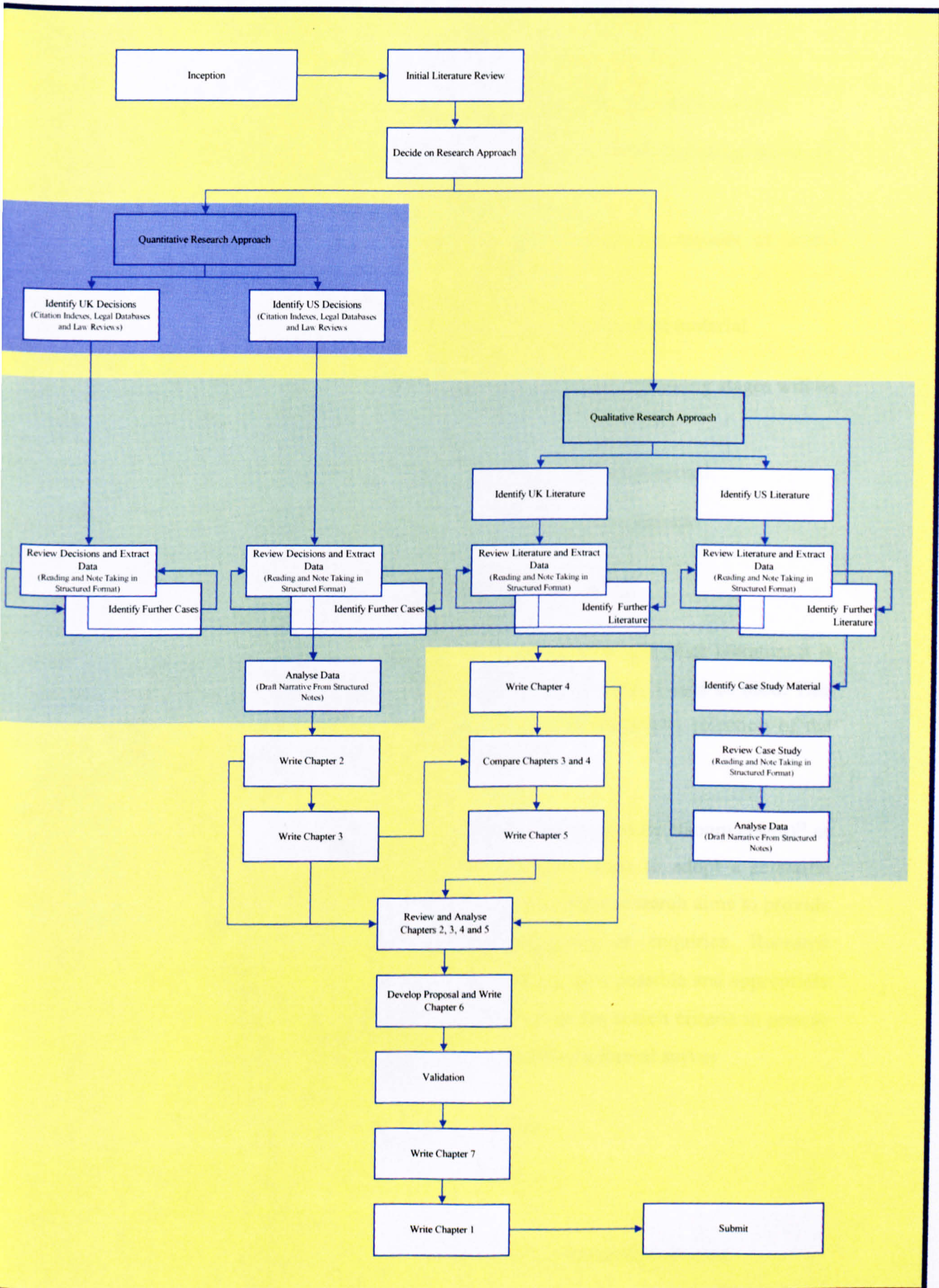
1.5.7. It is anticipated that the data collected by the primary research and analysis will be processed and written up in the following way:

- The data collected from the review of UK and US cases and literature will be incorporated in a Chapter which sets out a **Review of Current Literature and Cases**. This will be Chapter 2.
- A further chapter will derive a set of **Theoretical Concepts** from the **Review of Current Literature and Cases**. This will be Chapter 3.
- Using the **Theoretical Concepts** as an agenda, the data collected from the field study of the records of actual disputes will be incorporated in a further chapter which will describe **Current Practice**. This will be Chapter 4.
- Chapters 3 and 4 will be compared and a Chapter entitled **Current Practice v. Theoretical Concepts** will include the results of that comparison. This will be Chapter 5.
- Chapter 6 will contain **The Proposal**. The Proposal will be developed from the material included in Chapters 2, 3, 4 and 5. The Chapter will be in two sections, the first summarising the principles established in the preceding Chapters and the second developing the proposal by logical deduction from the first section.
- Chapter 7 will be **Conclusions and Recommendations** and will include the validation and conclusions and recommendations for further research.

1.5.8. This process of research is shown on the attached flow chart.



## Flow Chart Showing the Research Process





## **The Methodology**

1.5.9. A number of stages are required in respect of the primary research:

- Identification and collection of source material including decisions, articles, books and other literature;
- Identification of appropriate material from the records of actual disputes;
- The collection and collation of data from the source material.

Once the data has been collected and collated the following stages will be required:

- Summary of the results and development of the proposal.
- Validation of proposal and presentation of conclusions.

### **Identification and Collection of Source Material**

1.5.10. In order to identify the decisions, articles, books and other literature it is considered that a rigorous and disciplined approach should be used. This approach is appropriate to ensure that a representative selection of the available references is obtained identified.

This rigorous and disciplined approach is described by Naoum (1998)<sup>13</sup> as quantitative research. Quantitative research tends to adopt a scientific approach to information collection. Quantitative research aims to provide precise results to predetermined questions or enquiries. Research methods would include the use of a survey. It is possible and appropriate to specify the source of the material and set the search criteria in precise terms and conduct this part of the research as a formal survey

1.5.11. The survey will be carried out as follows:

- Identify the sources of the information;

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<sup>13</sup> Dr S G Naoum, (1998) Dissertation Research and Writing, Butterworth Heinemann.

- Search the sources for books, articles and decisions relating to the subject. The sources will include:
  - Quarterly abstracts published by CIOB and RICS;
  - Index of the Journal of American Society of Engineers.
- Searching library and other listings and summaries in respect of decisions. Citation Indexes will also be used to confirm the continued relevance of such decisions and identify further decisions where the initial decision has been cited, amended or followed. The listings and summaries will include:
  - All England Law Reports
  - Building Law Reports;
  - Construction Industry Law Letter;
  - Construction Law Digest;
  - Construction Law Journal.
- Searches for the following words and phrases are considered appropriate:
  - Delay Analysis;
  - Extension of Time;
  - Schedule Impact Analysis.
- Once obtained books, articles and decisions will include cross-references to other work in the field. Where relevant the cross-references should also be obtained.

Once the books, articles and decisions have been identified they need to be collected. Beyond the time required no particular problems are anticipated in respect of this task.

The books, articles and decisions identified are listed in Appendix 2 hereto.

## **Identification of Actual Disputes**

- 1.5.12. Beyond the initial identification of cases, books, and decisions and in respect of the analysis of the NMS records, a qualitative approach is considered appropriate to ensure that the appropriate material is extracted. The nature of the material does not lend itself to quantitative analysis but requires in-depth reading and the recording and distillation of a wide range of ideas and principles. According to Naoum (1998)<sup>14</sup> this would be classified as qualitative research. Qualitative research is appropriate where the data to be collected is rich and deep.

## **The Collection and Collation of Data**

- 1.5.13. It is difficult to predetermine the exact nature and extent of material which may be collected from each document or in respect of each of the disputes.

Once the literature and decisions have been identified and copies obtained, the collection and analysis of the data can proceed as if it were an interview of a real person. Although precise specification of the data to be collected is not possible a broad based pro forma can be constructed.

The NMS records can be interrogated using the principles which might ordinarily apply to a field study. Again, although precise specification of the data to be collected is not possible a broad based pro forma should be constructed. From the documents particular facts have been noted including the type of analysis used, the effectiveness of the presentation and any particular facts and circumstances relevant to the particular case.

The relevant data will be recorded by way of written notes. The notes will be sorted into appropriate headings. Once sorted the notes will be

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<sup>14</sup> Supra.



converted into a narrative and form the basic drafts for Chapters 2, 3, 4 and 5. The drafts will be refined using further material as appropriate.

### **Summary of Results and The Proposal**

- 1.5.14. The summary of the results will be drafted from the material contained in Chapters 2, 3, 4 and 5.

The proposal will be produced by logical deduction from the summary of the results.

### **Validation of Proposal and Conclusions.**

- 1.5.15. Validation is required to ensure that the proposed approach fulfils the legal, theoretical and practical requirements. This will be achieved by a manual cross-check between the requirements and the proposal.
- 1.5.16. Validation is also required to ensure that the proposed approach fulfils the hypothesis and in particular that the proposed approach is effective, conceptually sound and of practical application and is therefore likely to improve the efficiency of the preparation and prosecution of delay claims. This will be achieved through a process of expert review and observation in practice.

## **1.6. Overview of Conclusions**

The research has shown there are a number of practical difficulties in resolving delay claims. These difficulties have to be accommodated in the proposed method of analysis.

The practical problems fall into one or more of the following three categories:

- Those which may be (the) cause(s) of delay and contribute to the need

to produce an analysis;

- Those that the analyst must recognise may affect his choice of analysis method; and
- Those which the method of analysis must be capable of accommodating.

The ability to repeat the success of US schedule impact analysis techniques in the UK is limited by differences currently existing and as revealed by the study of US decisions and articles and in particular:

- the approach of contractors to construction planning;
- the contractual status of programmes;
- the willingness of the courts to descend into the detail of, for example, critical path analysis;
- the perception of matters of causation.

The review of articles, publications and decisions has produced sufficient material to identify a choice of approach and a range of analysis methods and techniques. The approach may be prospective, contemporaneous or retrospective. The retrospective approach is likely to be the most appropriate for use in the UK.

It is possible to define a number of techniques which can be used to analyse delay claims, particularly in areas of:

- the overall approach;
- data collection, methods and minimum requirements;
- analysis of the data;
- presentation of results;
- basic elements of proof.



There are four main stages in analysing and presenting delay claims:

- the collection and analysis of the factual data;
- interpretation of the data and preparation of the network programmes;
- determination of matters of causation and in particular issues of concurrency;
- preparation of the presentation.

The first two stages are concerned with the analysis of data. The third stage is concerned with the determination of matters of causation and will require the establishment of causal links and the rationalisation and explanation of competing and in particular concurrent causes. Analysis of the basic principles indicates that a broad view of concurrency should be adopted.

The initial stage covers the collection and analysis of the factual data. This stage will require a wide reading and analysis of the available documents and conducting interviews with key project participants.

The interpretation stage will include the distillation of the data and the construction of the model(s).

The final stage is the presentation of the conclusions which will include graphical presentations and narrative sections dealing with the delaying events.

The schedule impact analysis will be based upon the factual analysis and will be developed in the interpretation and presentation stage. Schedule impact analysis will identify and illustrate where there is a need to resolve matters of causation and in particular areas of concurrency and be an aid to their resolution.

The use of these techniques should, in the majority of decisions, enable the analyst to ascertain the periods of delay and the party or parties

responsible for the delay, identifying:

- Critical Path and Non-Critical Path delays;
- Excusable Compensable delay, Excusable Non-Compensable delay and Non-Excusable delay;
- Time entitlement.

Those involved in the resolution of time claims need to be familiar with and confident in the techniques so that the techniques may be used in their simplest form. Practitioners should develop a common approach.

## 1.7. Guide

### Chapter 2

- 1.7.1. In Chapter 2 current literature and decisions are reviewed to identify the methods of analysis available and the legal principles that need to be satisfied.

An initial literature review was carried out and this identified two US articles<sup>15</sup>. Those articles provided details of the basic principles of delay analysis used in the US and also included reference to a number of US decisions and other articles. By contrast no UK decisions or books or articles were identified. There were a number of decisions and books relating to particularisation of claims generally.

The search was extended to identify a sufficiently wide range of literature to be able to identify the way in which delay claims on construction projects are prepared and presented in the US and identify all available literature relating to UK law and practice. The required information and data was collected from four separate sources:

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<sup>15</sup> Wickwire Jon M and Smith Richard F, (1974) and Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989). Supra.

## **UK Decisions**

- 1.7.2. Relevant decisions were identified by using database search engines and from references in other law reports and other literature. Because legal principles may be derived from decisions relating to other subjects it is necessary to ensure that the search includes the relevant principles. Applicable principles include causation and concurrency, particularisation and rules of evidence.

During the research period new decisions were reviewed as they were published to identify any points of principle arising as new law or amending or replacing existing law. The published reports include a summary of the decision and also a copy of the full judgment. Publications such as BLR also include editorial comment on the decisions. Although often informative, such editorial comment may or may not be reliable and has to be checked against the full decision.

It was not possible to set precise reading and data extraction parameters because relevant information may be concealed in the legal language. In respect of any decision which contained relevant data, that relevant data was recorded by way of written note and included individually in the commentary in Chapter 2, Section 2.4. The relevant principles to be drawn from the decisions are summarised at the end of Section 2.4. and in Section 2.6.

## **US Decisions**

- 1.7.3. In principle the same process was used for UK and US decisions although many of the US decisions were processed from articles and other literature rather than directly from published reports. The US decisions are greater in number and deal, in detail, with the way in which time claims, for example, are analysed. By contrast the few UK decisions tend to be in respect of points of principle and more recently much preoccupied with the question of the adequacy of pleadings. This may be



because very few disputes have made it past the initial pleading hurdle.

- 1.7.4. Once recorded in the database, the decisions were all categorised to headings relating to the various aspects of delay analysis, including the status of the contractor's programme, acceptance of delay analysis methods, rejection of delay analysis methods, etc.
- 1.7.5. The decisions are generally cited in support of the appropriate general principles of analysis which are summarised in Chapter 2, Section 2.2.

### **UK Literature**

- 1.7.6. During the research period new books and decisions were reviewed as they were published to identify any points of principle arising either as a result of independent research or as a result of new law or amendment or replacement of existing law. Sources of new UK books and articles were the regular listings published RICS and CIOB and in certain law journals including Construction Industry Law Letter and Construction Law Digest.

In respect of any publication which contained relevant data, that relevant data was recorded by way of written note and included individually in the commentary in Chapter 2, Section 2.3. The relevant principles to be drawn from the publications are summarised at the end of Section 2.3 and Section 2.6.

### **US Literature**

- 1.7.7. In principle the same process was used for UK and US literature although US literature was far more extensive than for the UK. Mr Howard Gleason a US practitioner in field of schedule impact analysis reviewed the draft. His comments were verified and incorporated where appropriate.

When the main Sections were completed each was summarised to provide a distillation of the principles. The various principles are all drawn together in a final summary of the Chapter at Section 2.6.

### **Chapter 3**

- 1.7.8. Chapter 3 distils the theoretical concepts from the information collected in respect of methods of analysis available and the legal principles identified in Chapter 2. This was, in the main, a drafting exercise which was carried out using the theoretical concepts and general legal principles derived from the analysis of current literature and decisions set out in Chapter 2.

### **Chapter 4**

- 1.7.9. Chapter 4 described current UK practice in relation to delay on construction projects and the way in which delay claims were prepared and presented. As explained above in the methodology, the limited nature of the literature relating to UK law and practice, it was decided that a field study was the appropriate way to establish these matters. The records of NMS were available and for the reasons set out above were considered to be the best source for this purpose.

As part of this analysis relevant disputes were identified as being those in which an extension of time was being claimed. It was not possible to set precise reading and data extraction parameters because, although some overlapped, many of the disputes involved issues in respect of different aspect of delay analysis.

In respect of each dispute the relevant data was noted. The notes were sorted into the headings used in Chapter 3 and formed the first draft of Chapter 4. Relevant material obtained from the analysis of the decisions and the literature, carried out primarily for the purposes of Chapter 2, was also incorporated. The draft was checked against the previous Chapters



for consistency and finally edited.

## **Chapter 5**

- 1.7.10. Chapter 5 was required to identify the particular areas in which current practice falls short of the theoretical concepts, general problems and key factors to consider in producing an analysis. The comparison between the theoretical concepts set out in Chapter 3 and current practice, as described in Chapter 4 was carried out manually. Copies of the corresponding Sections of the two Chapters were read side by side and the areas of difference recorded in a document which formed Chapter 5.

## **Chapter 6**

- 1.7.11. Chapter 6 identifies solutions to the problems encountered where current practice falls short of the theoretical concepts and develops a proposal which incorporates the legal principles and the theoretical concepts and resolves the problems found in practice. The first three Sections of Chapter 6 summarise the three key requirements, compliance with legal principles, compliance with theoretical concepts and the incorporation of the points arising out of the rationalisation of the practical problems of application. This was mainly a drafting exercise.

## **Chapter 7**

- 1.7.12. Chapter 7 includes validation and also summary the conclusions of the research and a definition of its limitations and set out recommendations for further research.

The validation was required to ensure that the proposed approach fulfils the legal, theoretical and practical requirements. This was achieved by listing all of the requirements and identifying where they are fulfilled in the proposal. The comparison was carried out using a database to sort and compare the requirements and the proposal.

The validation was also required to ensure that the proposed approach fulfilled the hypothesis and in particular that the proposed approach is effective, conceptually sound and of practical application and is therefore likely to improve the efficiency of the preparation and prosecution of delay claims. This was achieved through a process of expert review and observation in practice. A number of experts, selected for their knowledge and standing in the field of construction disputes were approached and asked to complete a brief questionnaire. The answers to the questionnaire were all positive.

**Chapter 2 Review of Current Literature and Cases**

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## 2.1. Introduction

Chapter 2 will review current literature and law reports on decided cases to provide an understanding of the current state of knowledge. In particular the research will seek to identify the specific methods of analysis available and in current use and distil broad principles. This review and distillation will form the basis of the exposition of the theoretical concepts which will follow in Chapter 3. There will be separate sections dealing with developments in the UK and developments in the US.

Section 2.2 will review US literature and law reports and examine the development and use of Schedule Impact Analysis using Computer Scheduling Techniques in the USA. The extent to which those techniques are likely to be capable of transfer or adaptation for use in the UK will be considered. It is anticipated that it may be necessary to understand how the relatively sophisticated techniques now being used in the US have developed over time.

In Section 2.3 UK literature and law reports will be reviewed and the use and development of Schedule Impact Analysis using Computer Scheduling Techniques in the UK will be examined. A broad comparison will be made with the use and development in the US.

Section 2.4 will analyse the law reports of decided cases which are of general relevance to delay claims and identify the principles of law and practical application which may be derived from them.

Section 2.5 will analyse the decided cases relevant to the particularisation of claims in general and identify the principles of law and practical application which may be derived from them.

Section 2.6 provides a summary of Chapter 2 and will distil the general principles which are to be derived from the preceding Sections. The



general principles will be developed further in Chapter 3, Theoretical Concepts.

## 2.2. The Development of Schedule Impact Analysis Using Computer Scheduling Techniques in the USA

For reasons which become more apparent in Section 2.3 of this Chapter the starting point of this analysis is a paper entitled **The use of Critical Path Techniques in Contract Claims**<sup>1</sup>. This paper sets out a summary of the stage of development reached in 1974 in the USA<sup>2</sup>. By 1974 Schedule Impact Analysis using Computer Scheduling Techniques was a well established method of proving delay claims on construction projects. The method was also accepted by the US courts.

A subsequent paper in 1989 **Use of Critical Path Method Techniques in Contract Claims: Issues and Developments, 1974 to 1988**<sup>3</sup> reviewed the developments over that period. The conclusion of that subsequent paper was that:

*'The techniques and principles described in the original article have gained widespread acceptance. The article and the views expressed therein have been cited as authority in a number of cases.'*

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<sup>1</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974.

<sup>2</sup> This paper was based on a methodology developed by A James Waldron in the late 1960's. At first the method was developed to assist contractors presenting claims and after some initial resistance eventually found favour. However when Waldron started to work for clients rather than contractors he realised that this method was, without proper safeguards, likely to produce results which were particularly favourable to the contractor. This led to the development of the method to attempt to balance out the theoretical approach and take account of contractor caused delay.

<sup>3</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.

The 1989 article lists six cases<sup>4</sup> in which the 1974 article or the views expressed therein have been cited as authority.

By contrast with the UK, US case law related to delay claims and their analysis is extensive<sup>5</sup>.

The starting point is, however, different because, in particular, the programme is more likely to be a contract document and/or a document agreed between the parties. This means that the contractor is likely to take more care in the preparation of the programme and that this programme is an obvious starting point for any time analysis.

The following commentary demonstrates the different approach to the programme found in US law:

- Currie (1991) concludes that tying the owner to a CPM schedule is important to a contractor's chances of success of succeeding in delay claims against the owner<sup>6</sup>.
- An owner may be responsible for the time allotted in a CPM schedule for owner approvals when the owner approves the schedule<sup>7</sup>.

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<sup>4</sup> Utley-James, Inc., v. United States (Confirmed) 14 Ct. Cl. 804 (1988), Santa Fe Inc. VABCA Nos. 1943 et al., 84-2 BCA 17,34 (1984), Utley-James, Inc., (Appeal) GSBCA No. 5370, 85-1 BCA (CCH) 17,816 (1985), Santa Fe, Inc. VABCA No. 2168, 87-3 BCA (CCH) 20,104 (1987), Ballenger Corp DOT CAB Nos, 74-32 et al 84-1 BCA 16,973 (1984), Blackhawk Heating and Plumbing Co., (Appeal) GSBCA No. 2432-R, 76-1 BCA (CCH) 11,649 (1975) and Dawson Construction Co., (Appeal) GSBCA No. 2998, 75-2 BCA (CCH) 11,563 (1975).

<sup>5</sup> In the recent book by Pickavance (1997) 106 out of 293 cases cited are non-UK. Of the balance the large part deal with matters of contract and damages rather than the form of time analysis. Delay and Disruption in Construction Contracts, Pickavance K, LLP.

<sup>6</sup> Currie Overton A, (1991) Avoiding, Managing and Winning Construction Disputes, Article ICLR. See Contracting and Material Co. v. City of Chicago (314 NE 2d 598 (Ill. App. 1974)) and Peter Kiewit Sons' Co. v. Iowa Southern Utilities Co (355 F. Supp 376 (SD Iowa 1973)) also Defelice & Son, Inc. v. State of New York (313 NYS 2d 21 (1970)).

<sup>7</sup> Fullerton Construction Co., (ASBCA 12275, 69-2 BCA ¶ 7876 (1969)). A CPM (plus other contemporaneous evidence) accepted as notice of the need to approve certain drawings within 7 days of their issue.



- Where a subcontractor's bid was made in reliance of a general contractors schedule the schedule was considered to be part of the contract<sup>8</sup>.
- The prime contractor's failure to adhere to a construction schedule with the owner has been held to be a material breach of a subcontractor's contract, justifying the subcontractor leaving the job. Contractor breached contract when he supplied a template five weeks after scheduled date<sup>9</sup>.
- The general contractors failure to follow the sequences indicated in the approved schedule was held to excuse the subcontractor's refusal to perform its work out of the scheduled sequence despite the fact that the refusal acted to delay completion of the subcontractor's work<sup>10</sup>.
- Owner required work to be done out of sequence established by the CPM schedule and at earlier dates. Compensation was granted<sup>11</sup>. Western Electric Company negotiated, then assigned a subcontract for mechanical work with Natkin & Co. to George A. Fuller Co. It was a requirement of the subcontract that the CPM method of scheduling in accordance with a pre-bid schedule be used. The CPM was abandoned by Fuller before completion of the project. The court found the failure

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<sup>8</sup> General Insurance Company of America v. Hercules Construction (385 F.2d 13 (8th Cir. 1967) described in § 12.25).

<sup>9</sup> Gymco Const. Co. v. Architectural Glass & Windows, Inc., (884 F.2d 1362 (11th Cir. 1989)).

<sup>10</sup> Hunter Brothers Systems, Inc. v. Brantley Construction Co. Inc., (286 S.C. 59, 332 S.E.2d 206 (1985)).

<sup>11</sup> Natkin & Co. v. George A. Fuller Co., (347 F. Supp. 17 (W.D. Mo. 1972)). The federal court found that bar charts were '*not designed to afford an overall coordinated schedule of the total work covered by the contract. The significant ultimate facts in regard to the CPM and its abandonment and the inaccurate projected completion date are that the defendants were not interested in establishing an accurate completion date in accordance with the method provided by the contract; that no accurate or reasonable completion date for overall completion of the job was in fact established in accordance with contract procedures or otherwise; that various completion dates for particular portions of the work were dictated and established without Natkins consent, regardless of what impact such dates might have had on the totality of the work covered by Natkins subcontract; and that the defendants elected to take their chances as to whether their actions might violate Natkins contractual rights.*' The court held that abandonment of the CPM schedule was a violation of the subcontractor's contractual rights and awarded the subcontractor damages for delay and disruption.

to schedule and control the work as indicated on the CPM schedule a breach of contract entitling Natkin to recover its extra costs Courts have consistently held bar charts to be less effective than network diagrams as a scheduling technique to define delays.

- Government failure to approve a performance schedule at the outset prevented the contractor from proceeding with performance and was deemed a suspension of work<sup>12</sup>.
- A schedule was accepted as representative of a contractors intent for the purpose of measuring impact<sup>13</sup>.
- Failure to properly sequence the work caused subcontractor damage and breached implied duty not to interfere with other parties performance<sup>14</sup>.

Many large US construction contracts let by federal government and private industry contain provisions requiring the use of special devices for scheduling and co-ordinating the work<sup>15</sup>. In respect of the specifications for Government contracts Wickwire explains that:

*'Mostly they require CPM or PERT.*

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<sup>12</sup> Triax Co Inc. (ASBCA No. 33899, 88-3 BCA ¶ 20,830 (motion for reconsideration denied 21 September 1988) (1988)).

<sup>13</sup> W. A. Stevenson Construction (Western) Ltd. v. Metro Canada Ltd., ([1987] 27 CLR 113. A schedule was accepted as representative of a contractors intent for the purpose of measuring impact because: *'... for the purpose of costing and of scheduling the contractor broke down the work on each column structure to eight 'activities' ... This schedule was in bar chart form and was sent to the owner with a letter which outlined the contractors methods and plans, 'prior to August 29 the closing date for bids' ... [The] resident engineer ... obtained a copy pinned it on the wall ... and used it as a tool to evaluate the contractors progress during the entire administration of the contract. Prior to the contract award and after bid analysis ... [the] ... engineers conducted a 'tender clarification meeting ... the minutes of which show: 7b) G Gualco [the owners representative] requested that a new and adjusted schedule be submitted for consideration. The owners agents took away the scheduling information and on September 16 awarded the contract to the contractor'*.

<sup>14</sup> Blake Construction Co. v. C. J. Coakley Co., (431 a>2d 569 (D.C. 1981)).

<sup>15</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974.



*They include requirements to produce and periodically update the CPM or PERT format method to reflect contract performance.*

*Contract provisions range from the simple to the complex.'*

Some of the most comprehensive are the requirements in the Armed Services Procurement Regulation used by Department of Defense (ASPR 7-604.7, 7-604.8)<sup>16</sup>.

The requirements clearly indicate that:

*'the contractor is responsible for the preparation of a network analysis system and the scheduling of the construction.*

*the purpose of the network analysis system is to assure adequate manning and execution of the work and assist the Contracting Officer in approving the reasonableness of the progress schedule and evaluating progress of the works.*

*acceptable types of network analysis systems are those as listed in Appendix I of the Corps of Engineers Regulation ER-1-1-11 'Network Analysis Systems' which gives guidance on the use of various management systems including CPM and PERT.*

*the system is to consist of diagrams and accompanying mathematical analysis. These diagrams are to display the elements of the project in detail and give a complete summary of the work required.*

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<sup>16</sup> Quoted from: Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974.

*the schedule is to reflect the submittal and approval of samples of material and shop drawings, the procurement of critical materials and equipment, the fabrication of special material and equipment and its installation and testing.*

*Scheduling is to be in two stages:*

*a preliminary network for the first sixty days, followed by;*

*a more detailed network diagram and mathematical analysis.'*

Although such provisions may be found in some UK construction contracts<sup>17</sup> it is doubtful whether they are likely to be rigorously enforced and in any event even strict adherence to such provisions would not raise the programme or the construction methods or sequence implicit therein to the status of contract documents and/or terms<sup>18</sup>.

It is clear from the cases, text books and articles that the techniques:

- are well established, and;
- have developed over a period of some years.

The concepts and techniques were the subject of a two day seminar organised by Legal Studies & Services Limited on 19th and 20th June

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<sup>17</sup> See for example the MF1 Form. In the UK Critical Path Techniques are more likely to be used on Civil Engineering projects, marginally more likely to be used in Heavy Engineering projects and most likely to be used in Oil Industry projects.

<sup>18</sup> Analysis of UK case law will show that this is not achieved by the incorporation of the programme as a 'contract document'. See in particular *Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical*. (1989) 6-CLD-02-07 (Q.B. 1989) and *Yorkshire Water Authority v. Sir Alfred McAlpine & Son (Northern) Ltd.* (QBD 1985) 32 BLR 114 as set out more fully below.

1991. The course documentation<sup>19</sup> provided a summary of the current status of US law and practice.

All of the US text books and articles tend to quote a number of cases as source for their commentary. Details of the cases indicate that:

- construction claims are reviewed by US courts in far more detail than is the case in the UK;
- the way in which both the construction planning process and the resultant programmes are viewed is quite different from the UK approach<sup>20</sup>.

In the US those trying time and other construction disputes are clearly specialists who are quite happy to work through, for example, the detail of complex network programmes. Amongst the reported cases can be found commentary on just about every aspect of construction disputes.

### 2.2.1. Methods of Analysis Generally

According to Callahan<sup>21</sup> there are a number of ways in which a schedule can be used to measure delay and to demonstrate the impact of project delay. The methods available range from simplistic to complex. The methods that are easiest to explain may suffer from simple-minded logic that may tend to distort the true picture. The most complex are often the most accurate, yet may be difficult to understand and explain.

All methods of schedule impact analysis share common concepts, the most important of which is the premise that delay is measured from the

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<sup>19</sup> Particularly papers given by Michael Callahan. Michael Callahan was at that time president of CCL Construction Consultants Inc. Kansas City, USA and author of 'Construction Delay Claims' and 'Arbitration of Construction Disputes'.

<sup>20</sup> Although beyond the scope of this work it would be interesting to study whether, and if so to what extent, construction planning in the US has improved as a result of the failure to recover on delay claims as a result of poor planning.

<sup>21</sup> Callahan Michael T, (1991) Delay Analysis, Conference Papers.



overall project completion date rather than by reference to any interim activity dates. Attempts to measure delay by comparing planned to actual completion of individual activities in isolation rather than the overall project completion dates have been regularly rejected by US courts<sup>22</sup>. There are however some circumstances where such an analysis may be appropriate.

A schedule may fail, both in the field and as the basis of a delay analysis, because of failures in the scheduling process rather than mistakes in the schedule. Such failures may include<sup>23</sup>:

- Failure to incorporate the shop-drawing procedure of submission, approval, fabrication, and delivery of material linked to construction activities;
- Failure to recognise and schedule the work of other trades;
- The use of gross scheduling eg 'install mechanical services'. This does not allow for project control or analysis at the level of detail necessary to prove a delay;

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<sup>22</sup> The Contractor is not necessarily entitled to an extension of time having exactly the same duration as the quantity of time that elapsed between the beginning and the end of the period while extra work is being performed or during which the work was being prevented. *'A contractor who seeks an extensions of time on account of an excusable cause of delay has the burden of proving..... the extent to which the orderly progress or ultimate completion of the work as a whole was delayed thereby.'* *Montgomery - Macri Company v Western Line Construction Co.*, (IBCA 59, 72, 1963 BCA ¶ 3819 (1963) at 19,038.). And *'By way of example if the employer were to postpone work on a critical activity by 120 days and by re-sequencing the work the contractor is able to reduce the delay to overall completion to 45 days he is entitled to a 45 day extension not 120 days. This raises two further questions, first, at what point in time should the delay to the project be measured and second, at what point in time should extension be granted.'* Wickwire Jon M and Smith Richard F, (1974) *The use of Critical Path Techniques in Contract Claims*, Article Public Contract Law Journal Vol 7 No 1, October, 1974. See also *Dawson Construction Co.*, (Appeal) (GSBCA No. 2998, 75-2 BCA (CCH) 11,563 (1975)), *Fishbach & Moore Int'l Corp.*, (Appeal) (ASBCA No. 18,146 77-1 BCA (CCH) 12,300 (1976)), *Fletcher & Sons, Inc.*, (VABCA No. 2502, 88-2 BCA 20,667 (1988)), *Preston-Brady Co.* (VABCA 1892, 1991, 2555, 87-1 BCA Par. 19,649 (1987)), *Santa Fe Inc.* (VABCA Nos. 1943 et al., 84-2 BCA 17,34 (1984)) and *Tectronics Inc. of Florida v. United States* (10 Ct. Cl. 296 (1986)). *Hoyer Construction Co.* (Appeal) (ASBCA No 31242, 86-1 BCA (CCH) 18731 (1986)).

<sup>23</sup> *C. H. Leavell & Co.*, (GSBCA 2901, 70-2 BCA 8437 (1970)).

- Failure to sequence work properly<sup>24</sup>;
- Failure to incorporate procurement periods<sup>25</sup>;
- The programme may be rejected if it fails to have regard to relevant records<sup>26</sup>;
- The programme may be rejected if the logic intentionally deviates from the manner in which the contractor actually intends to complete the project<sup>27</sup>;
- The schedule did not provide for seasonal restraints<sup>28</sup>.

The decided cases indicate that, in order to be accepted as a basis for the demonstration or definition of a delay, a baseline schedule must accurately reflect both the contractor's intent and the practical field constraints<sup>29</sup> that apply to the activities. This applies equally whether the schedules are originally prepared for constructing the project or post completion. The analysis must also accurately reflect As-Built information<sup>30</sup>. To use CPM properly the underlying data must be

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<sup>24</sup> See also *Chaney & James Construction Co. v. United States*, 190 Ct. Cl. 699, 421 F.2d 728 (1970).

<sup>25</sup> *Edwin J. Dobson, Jr., Inc. v. Rutgers* (157 N.J. Super. 357, 384 A.2d 1121 (1978)) *The New Jersey court found that it was not until the third update, when the contractor's procurement schedule was incorporated, that sufficient information was included in the schedule to consider it complete and able to measure delay.*

<sup>26</sup> *A Teichert & Son, Inc.*, (ASBCA 10265 et al., 68- BCA ¶ 7175 (1968)) CPM analysis rejected. Many relevant records disregarded by the expert, the analysis showed electrical work when no electricians on payroll.

<sup>27</sup> *E. C. Ernst, Inc. v. Manhattan Construction Co. of Texas*, (387 F. Supp. 1001 (S.D.Ala. 1974)).

<sup>28</sup> *Titan Pacific Construction Corp. v. United States* (17 Ct. Cl. 630 (1989)). The Claims Court refused to allow a contractor's as-planned schedule as a measure of delay because, among other things, the schedule did not provide for seasonal restraints for work in moisture sensitive soils during the wet season.

<sup>29</sup> Callahan Michael T and Hohns H Murray, (1983) *Construction Schedules* (page 121), The Michie Company Law Publishers. Field constraints eg environmental factors including location, local labour arrangements, material availability, site and access conditions, weather etc.

<sup>30</sup> *Ballenger Corp* (DOT CAB Nos, 74-32 et al 84-1 BCA ¶ 16,973). ... the CPM's usefulness as a barometer for measuring time extensions and delay damages is necessarily circumscribed by the extent to which it is employed in an accurate and consistent manner to comport with the events actually occurring on the job).



accurate<sup>31</sup>. If the input is introduced carelessly it will become an added burden to the job which hinders rather than helps.

Barcharts have been rejected as the basis for proving delay claims<sup>32</sup> although barcharts are still often used for the presentation of results<sup>33</sup>.

It is possible to identify a number of alternative methods of analysis. Some appear to be similar but are referred to by different commentators by different terminology some appear to be subtle variations of others.

One of the key choices is to establish the starting point of the analysis. Wickwire<sup>34</sup> makes the following observation:

*'Determining the reference point, or baseline, from which to measure impact is the most significant issue and one which involves the choice between the following three options:*

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<sup>31</sup> Carl M. Halvorson, Inc., (ENG BCA 2784, 73-1 BCA ¶ 9900 (1973)). A CPM based presentation failed because it did not relate to the project records. In fact the detail of the presentation was directly at odds with the governments daily logs.

<sup>32</sup> Minimar Builders, Inc. (Appeal) (72-2 BCA (CCH) ¶ 9599 at 44,857 (1972)). The General Services Board of Contract Appeals refused to believe the bar charts offered to show that the delay affected project completion: *'Since no interrelationship was shown as between the tasks the charts cannot show what project activities were dependant on the prior performance of the plastering work and ceiling work, much less whether overall project completion was thereby affected. In short, the schedules were not prepared by the critical path method (CPM) and hence are not probative as to whether any particular activity or group of activities was on the critical path or constituted the pacing element of the project.'* See also Natkin & Co. v. George A. Fuller Co., 347 F. Supp. 17 (W.D. Mo. 1972). Courts have consistently held bar charts to be less effective than network diagrams as a scheduling technique to define delays. The federal court found that bar charts were *'not designed to afford an overall coordinated schedule of the total work covered by the contract'*. And Haas & Haynie Corp. (Appeal) (GSBCA No. 5530, 84-2 BCA (CCH) ¶ 17,446 (1984)). The General Services Board of Contract Appeals refused to accept a bar chart to prove a delay because the bar chart could not depict the effect of changes on the interrelationship of job activities as a CPM schedule could.

<sup>33</sup> Dawson Construction Co., (Appeal) (GSBCA No. 2998, 75-2 BCA (CCH) ¶ 11,563 (1975)). Detailed CPM analysis illustrated by a bar chart. *'Because of their high visibility bar charts remain important to demonstrate or summarize a critical path analysis. The bar chart is not a substitute for the network diagram'*.

<sup>34</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.



*'Forward pricing' or measuring the delay at its inception;*

*'Contemporaneous pricing' as it is occurring or immediately after it has occurred;*

*'Hindsight pricing' the delay after project completion.'*

Here the expression 'pricing' refers to the calculation or evaluation of time entitlement. It is likely that the third option 'hindsight pricing' will appear the most appropriate to the analyst faced with resolving time claims after project completion. There is, however, no reason why forward or contemporaneous pricing cannot be used after the event. As will be seen later these are not specific methods of analysis but different approaches.

Forward pricing would include the method described elsewhere by other commentators as the As-Planned method<sup>35</sup>. This method takes the contractors original schedule, or a reconstruction thereof, and impacts that with the delaying events. This method ignores actual progress and performance, changes in sequence and other, contractor generated, delaying influences. The As-Planned method may be used with refinements that seek to minimise its short comings.

The Update Impact Method as described by the Corps of Engineers and preferred by Callahan<sup>36</sup> is an example of contemporaneous pricing. This method is complex and depends upon having an accurate status report at the point of commencement of the change under consideration. On a

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<sup>35</sup> This is a particular example of confusing terminology. Reference is made elsewhere to the As-Planned schedule. The As-Planned schedule being the baseline programme against which delays are measured. The method referred to here is where the As-Planned schedule is impacted to show the effect of potential delaying events. The resultant schedule may be referred to as the As-Adjusted schedule or the Impacted schedule.

<sup>36</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.

large complex project analysis would be required at a considerable number of separate points during the progress of the project.

The But-For<sup>37</sup> type of analysis and As-Built method are types of hindsight pricing. This type of analysis starts with the As-Built programme and seeks to remove or simply explain the delays due to one party to see what reduction in duration may be achieved.

Analysis of the literature and decided cases indicates that the best suited method of analysis will depend on a number of factors:

- the type and extent of schedule information available;
- the progress and performance data available;
- the circumstances and extent of the delay and the competing causes;
- the rules of any scheduling clause(s);
- contract terms as related to delay and or extension of time;
- time and cost constraint applicable to the analysis itself.

The most appropriate approach for application in the UK use may be dictated by an analysis of the contractual basis of entitlement.

### **2.2.2. The Method Described by Wickwire in 1974**

According to Wickwire<sup>38</sup> proof of a delay claim will entail the

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<sup>37</sup> Again this tends to be a confusing description as the But-For schedule or analysis is likely to be derived from an As-Built schedule. An As-Built schedule may also be required as part of a broader analysis.

<sup>38</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974.

preparation of the following four CPM<sup>39</sup> schedules (or models):

- A Reasonable As-Planned CPM;
- An As-Built CPM
- An As-Built CPM including all delays;
- An As-Adjusted CPM to establish completion of the project absent government<sup>40</sup> delays.

Each schedule (or model) should be supported by an analysis of, and reference to, the appropriate project records.

The delay will be measured by the difference between the completion date shown on the As-Built CPM and the completion date shown on the adjusted CPM<sup>41</sup>.

According to Wickwire<sup>42</sup> a CPM claim presentation must answer two questions to provide sufficient proof of an extension of time claim:

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<sup>39</sup> It is interesting to note that even as early as 1974 Wickwire was apparently committed to the use of CPM for the analysis of time claims.

<sup>40</sup> In the US many of the decided cases, contract forms and text book references are related to Government funded work. For Government read Employer.

<sup>41</sup> Although not described by Wickwire a fifth schedule might, some may say ought to, be used. This would be an adjusted CPM to establish completion of the project absent contractor delays. This may well establish a completion date later than the actual completion date which would be indicative of the extent of mitigation carried out by the contractor. If this schedule established a completion date earlier than the actual completion date the contractor would only be entitled to an extension up to the earlier of the two dates.

<sup>42</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974. See also Cannon Construction Co., (ASBCA 16142, 72-1 BCA ¶ 9404 (1972)). This decision sets down basic criteria by which to prove entitlement for extended duration:

- (a) determine the date as precisely as possible upon which the contractor would have completed the contract work but for delays which might have been due either to government fault or changed work.
- (b) determine the date of the completion of the work.
- (c) test whether the duration of delays due government fault and changed work are equal to or greater than the actual delay.



- first, when did the contractor actually complete its work;
- second, when would the contractor have completed its work absent government (employer) delays.

After giving credit for all non-excusable and non-compensable delays, the difference would be the measure of the impact of government (employer) caused delays. This original description of the methodology is consistent with the hindsight pricing approach<sup>43</sup>.

#### 2.2.2.1. Reasonable As-Planned CPM

The reasonable As-Planned CPM chart is prepared in order to establish the time in which the project would have been completed absent any delays. This chart may provide the basis of the adjusted CPM. It is important to determine precisely the time schedule and construction sequence the contractor intended to use. According to Wickwire this chart should take into account:

- significant time saving techniques even when discovered post contract<sup>44</sup>;
- adjustments to correct errors in logic or duration;
- the as-planned chart must be validated<sup>45</sup>.

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<sup>43</sup> As will be seen later Wickwire subsequently developed this methodology into one which is consistent with the contemporaneous pricing approach.

<sup>44</sup> This notion seems at least arguable. If the contractor has accelerated, at his own cost, to mitigate delay already caused by the owner it would be wrong to deprive him of an additional time entitlement in this way. Such adjustments could perhaps be limited to no cost sequence changes. Some commentators would contend that the contractor ought to be entitled to the use of any additional float created by such changes.

<sup>45</sup> *Pacific Constr. Co., Ltd v. Greater Vancouver Regional Hospital District*, ([1986] 23 CLR 35 (B.C.S.Ct.)). The British Columbian Supreme Court said in order to measure an impact claim with a schedule it would '*be necessary to evaluate the validity of the contractor's original contract schedule and the 'reasonable contractor schedule' before comparison to the actual performance*'.

Correction of errors may be resisted if the schedule was submitted and approved by the government early in the project. Correction of over estimates may be welcomed by the Contractor<sup>46</sup>.

According to Wickwire<sup>47</sup> the analysis must at least:

- show and demonstrate the critical path;
- establish the source and basis of<sup>48</sup>:
  - sequence of events;
  - manloading;
  - duration of activities;
- detail changes to any of the foregoing (either contemporaneous or subsequent) incorporated<sup>49</sup> into the as planned chart.

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<sup>46</sup> It is possible that the As-Planned CPM would give an earlier completion date than the contractual completion date.

<sup>47</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974.

<sup>48</sup> The review of current practice in Chapter 4 shows that this information is notoriously difficult to obtain from contractors. Either contractors do not record such information or they fail to retain such records as are produced. Contractors often produce programmes without the benefit of such detailed consideration.

<sup>49</sup> This is not to be confused with the incorporation of as-built information. It is frequently necessary to make adjustments to a contractor's original programme to correct errors or in the course of producing a suitable baseline for the purposes of analysis.

The reasonableness of the as planned chart may be established by expert testimony<sup>50</sup>.

#### 2.2.2.2. As-Built CPM

The As-Built CPM is produced to show how the project was actually constructed and to demonstrate the actual completion date.

According to Wickwire, given proper records, this should be a mechanical task requiring little interpretation<sup>51</sup>. Actual dates and durations may be available from the updated CPM. The updated CPM must, however, be checked against the project records. In completing the As-Built CPM it is necessary to:

- detail points where the 'As-Built' conforms with the 'As-Planned'<sup>52</sup>;
- detail points of variance;
- explain actual durations and sequences where at variance;
- locate the actual critical path.

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<sup>50</sup> See *Blackhawk Heating and Plumbing Co., (Appeal)* (GSBCA No. 2432-R, 76-1 BCA (CCH) ¶ 11,649 (1975)). A court may accept a retrospective analysis to demonstrate delay even though the contractor used another, incomplete schedule to manage the project. The Board of Contract Appeals utilized an outside consultants schedule because the contractor's schedule did not provide sufficient detail to analyse delay. The consultant's schedule broke down the contractors schedule into more detail permitting a more meaningful analysis of delays. In adding activities the consultant made the contractor's schedule more useful while maintaining the basic plan. See also *Georgia Power Co. v. Public Serv. Com'n*, (396 S.E.2d 562 (Ga.App. 1990)). The court endorsed the use of a schedule prepared by a third party consultant after the project had started in preference to the schedule analysis prepared by the project manager. And *Thiess Properties Pty. Ltd. v Ipswich Hospitals Board (No.2)*, ([1985] 2 Q.R. 318). Reliability may be demonstrated by expert evidence. Schedule analysis was recognised to be within the field of expertise of a quantity surveyor. The court accepted the testimonial description of the schedule given by the contractors project manager despite conflicts with the written, submitted, and approved schedule.

<sup>51</sup> See the comments of Callahan below in respect of the As-Built method of analysis. Although in that context the As-Built analysis is considered as a stand-alone methodology the comments regarding as-built data are considered appropriate. See also *Montgomery - Macri Company v Western Line Construction Co.*, (IBCA 59, 72, 1963 BCA ¶ 3819 (1963) at 19,038).

<sup>52</sup> It is a strong evidential point to establish whether or not the contractor was able to comply with its original programme in areas where it was not delayed or disrupted by the owner.



In the field a delay to the critical path may not necessarily delay completion (e.g. by the use of mitigation) conversely a short delay to a critical activity may have an aggravated result if it coincides with some intervening event (e.g. weather).

Costs incurred in an effort to mitigate delays may be recoverable under such clauses as those dealing with Suspension of Works or Changes generally<sup>53</sup>.

Case law supports the granting of an additional delay caused by the original delay pushing work into a period of bad weather<sup>54</sup>.

#### **2.2.2.3. As-Built CPM Including All Delays**

The 'As-Built CPM Including All Delays' schedule is developed from the 'As-Built CPM'. This requires the segregation of all delays<sup>55</sup>, government, contractor and excusable, that affected the project showing:

- activities affected;
- the time span of each delay;
- changes in sequence;
- the nature of the delay;
- impact on completion date.

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<sup>53</sup> See Cannon Construction Co., (ASBCA 16142, 72-1 BCA 9404 (1972)). This is not consistent with English law.

<sup>54</sup> See for example Montgomery - Macri Company v Western Line Construction Co., IBCA 59, 72, 1963 BCA 3819 (1963). These decisions are consistent with the position under English law.

<sup>55</sup> Gulf Contracting, Inc., (on Appeal) (ASBCA No. 30195, 89-2 BCA (BNA) ¶ 21,812 (1990)). Delay analysis must take into account all delays that may have occurred. Using an as-built schedule that ignored one party's delays was rejected on appeal.

Each delay can be colour coded and fully documented and explained with appropriate references to contract documents and project records.

The importance of proper preparation in this area cannot be over emphasised. Even minor inaccuracies can be fatal<sup>56</sup>.

#### **2.2.2.4. As-Adjusted CPM**

As envisaged by Wickwire this chart is intended to demonstrate when the contractor would have completed the project absent owner delay.

Wickwire suggests two possible approaches to the presentation of this chart:

- Remove all government delays affecting the critical path from the segregated As-Built CPM. This may however produce an unrealistic result when there has been significant changes in working method or sequence; or
- Adjust activity durations and sequences to arrive at what would have been a realistic schedule absent government delays.

Although developed by Wickwire as part of a particular methodology the description of the preparation of the various schedules stand as good explanations of how the various schedules which may be required as part of an analysis should be assembled.

#### **2.2.3. Developments Between 1974 and 1988**<sup>57</sup>

The 1988 article confirmed that the techniques and principles described in the 1974 article had gained widespread acceptance. The article and the

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<sup>56</sup> See Joseph E. Bennett Co., (Appeal) (GSBCA 2362, 72-1 BCA 9364 (1972)).

<sup>57</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.

views expressed therein had, in the intervening period, been cited as authority in a number of cases.<sup>58</sup>

Since 1974 developments in contract clauses, case authority and government regulations appear to support the view that determination of delays affecting the critical path should be analysed using a contemporaneous pricing approach. This dictates that the analyst start at the beginning of the project and determine the status of the project at monthly or quarterly reference points or other key points using the updating process as a reference base. This contemporaneous analysis may be carried out after the event using project records.

This approach is consistent with the approach which is inherent in the methodology developed by US Army Corps of Engineers and described in their 'Modification Impact Evaluation Guide'<sup>59</sup>. This method has also been referred to by various commentators as the 'Update Impact Method', 'Corps Method', 'Time Impact Analysis', 'Contemporaneous Impact' and the 'Snapshot Technique'

The basic technique distilled by Wickwire from the cases decided over the intervening period<sup>60</sup> is to compare the As-Planned CPM with the As-Built CPM. First ask how the construction of the project was planned, then consider the following:

- How was the project actually constructed;

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<sup>58</sup> See for example: Utley-James, Inc.,(Appeal). GSBICA No. 5370, 85-1 BCA (CCH) ¶ 17,816 (1985); Santa Fe, Inc. VABCA No. 2168, 87-3 BCA (CCH) ¶ 20,104 (1987); Ballenger Corp. DOT CAB Nos, 74-32 et al 84-1 BCA ¶ 16,973); Blackhawk Heating and Plumbing Co., (Appeal). GSBICA No. 2432-R, 76-1 BCA (CCH) ¶ 11,649 (1975); Dawson Construction Co., (Appeal). GSBICA No. 2998, 75-2 BCA (CCH) ¶ 11,563 (1975).

<sup>59</sup> Department of the Army, Office of the Chief of Engineers - 1979.

<sup>60</sup> See for example Haney v. United States 230 Ct. Cl 148, 676 F.2d 584 (1982). The court noted that: *'The CPM analysis of delay presented on behalf of plaintiff took into account, and gave appropriate credit for all of the delays which were alleged to have occurred, including the results of plaintiff's acceleration by expediting equipment and materials, working out of sequence, weather delays, and the strike by the operating engineers'*.



- What are the differences between the project as planned and as constructed with reference to activities, sequences, durations, manpower, and other resources;
- What are the causes of the differences or variances between the project as planned and the actual performance;
- Finally, what are the effects of the variances in activities, sequences, durations, manpower, and other resources, as they relate to the costs experienced, both by the contractor and the owner.

In considering the position from the point of view of both contractors and the owner Wickwire is contemplating producing As-Adjusted Owner and As-Adjusted Contractor schedules as described by Waldron<sup>61</sup>.

It appears that over this period Wickwire and other commentators moved from the 'hindsight pricing' approach to the 'contemporaneous pricing' approach although the methodology has largely remained constant. The Wickwire approach might however be considered to be looking at the problem from the point of view of the analyst seeking to explain delay after the event whereas the Corps Method is to assess the impact before the delay occurs. Although the Corps Method was developed to deal with delay before it occurred the principles can be applied after the event providing that sufficient information is available from the project records<sup>62</sup>.

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<sup>61</sup> Waldron A James, (1984) Establishing Liability and Quantum in Delay, Disruption and/or acceleration cause, A lecture paper.

<sup>62</sup> *'The standard operating manuals for the major government contracting agencies recognise the dynamic nature of the CPM process, the necessity for updating schedules in a timely manner, determining time extensions as a part of the updating process, and the comparative process used in analysing delays. Use of Critical Path Method Techniques in Contract Claims'*: Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) *Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988*, Article Public Contract Law Journal.

According to Callahan<sup>63</sup> the Update Impact Method is the best method of measuring the effect of delay. The Update Impact Method described by Callahan is the method set out in the US Army Corps of Engineers 'Modification Impact Evaluation Guide'<sup>64</sup>.

The comments of Callahan give a helpful overall impression of the approach. These comments are set out here. A detailed description of the actual guide is set out below in the sub-section dealing with the methods of analysis generally.

The Update Impact Method uses the 'contemporaneous pricing' approach. Use of the Update Impact Method requires details of job status at the time of the alleged delay if such information is not available this method may not be suitable. The use, with proper safeguards of the As-Planned Method may be preferable in such circumstances<sup>65</sup>.

First the current status of the job is established. The current status of the job is determined without reference to the contractors approved schedule. Current status is used because the contractors real plan may be different from the approved plan, or the schedule may not have been revised to reflect the effects of previous modifications. For example, some activities may start without regard to the sequence or time shown in the formal schedule; quality control and quality assurance reports may reveal past production inefficiency or delaying factors not shown in the formal schedule; or anticipated late delivery of materials which will delay parts of the work may be found<sup>66</sup>.

This first stage means that the schedule must be updated at the time of the delay and if necessary the plan adjusted to reflect the manner in which the

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<sup>63</sup> Callahan Michael T, (1991) Delay Analysis (Page 34), Conference Papers.

<sup>64</sup> This method has also been referred to as the 'Corps Method', 'Time Impact Analysis', 'Contemporaneous Impact' and the 'Snapshot Technique'.

<sup>65</sup> Callahan Michael T, (1991) Delay Analysis (Page 53), Conference Papers.

<sup>66</sup> This requires an extensive understanding of the status of both on and off-site activities.



contractor intends to complete the project. The status of progress at the time of the delay must be established<sup>67</sup>:

- A project schedule is not a fixed document<sup>68</sup>. It is necessary to anticipate and react to unforeseen problems, adverse weather, change orders, better knowledge, mistakes and other surprises. Considerable time and effort is necessary to check progress and take action to bring work back to schedule or adjust the schedule. Updating often reveals changes to the critical path<sup>69</sup>, progress rates, activity durations and float times. Monthly updates are the norm but dependent on size, complexity and characteristics of project. Updating may be a contractual requirement. Degree of detail of the updating may vary for similar reasons. An update may include:

- actual start and finish dates;
- percentage completion;
- revised activity durations;
- revised logic.

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<sup>67</sup> A schedule that is not updated to reflect the current status of the job may be rejected as the basis of analysis. (Casson Construction Company Inc., (Appeal)GSBCA Nos. 4884, 5103, 5132, 5335 to 5338, 5403, 5405, 5423, 5434, 83-1 BCA (CCH) ¶ 16,523 (1983; William Passalacqua Builders, Inc. (Appeal)77-1 BCA (CCH) ¶ 12,406 (1977); Georgia Power Co. v. Public Serv. Com'n,396 S.E.2d 562 (Ga.App. 1990)1990).

<sup>68</sup> Callahan Michael T, (1991) Delay Analysis (Page 6), Conference Papers.

<sup>69</sup> *'New critical paths are likely to be identified as a schedule is revised through the updating process. Delays to the original critical path may, due to updating, not affect the project completion date.'* (Blackhawk Heating and Plumbing Co., (Appeal)GSBCA No. 2432-R, 76-1 BCA (CCH) ¶ 11,649 (1975)) See also (Santa Fe, Inc.VABCA No. 2168, 87-3 BCA (CCH) ¶ 20,104 (1987)) *'The work had been suspended for 30 days because of uncertainty as to how to resolve necessary changes to air-handling units and the contractor claimed a corresponding extension suggesting that the units were on the critical path. The employer was able to demonstrate that although the units were on the critical path on the CPM update for the month during which the suspension was ordered, on the next update the units were shown to be off critical path. The employer argued that the contractors reliance on the earlier update was incorrect. This was accepted by the board who found that only part of the suspension should be granted. The board held that the monthly updates to the CPM possessed a rebuttable presumption of correctness as the parties had mutually agreed them during the update process and treated them as part of the contract.'*



- Whilst updates ought to be carried out with care often they are not<sup>70</sup>.

Common problems include:

- Incorporation of unilateral rather than mutual decisions<sup>71</sup>;
- employers take little interest even when a regular update is required by the contract;
- prepared with insufficient care;
- manipulated by imposed results to, for example, show a particular subcontractor or the employer causing delay. Imposed results are not readily apparent on the schedule, and without careful study may not be detected. The finder of fact should review both the updates and the parties conduct during their preparation.

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<sup>70</sup> Callahan Michael T, (1991) Delay Analysis (Page 10), Conference Papers.

<sup>71</sup> However see (Santa Fe, Inc. VABCA No. 2168, 87-3 BCA (CCH) ¶ 20,104 (1987)) *'Although changes made during the update process may be the result of unilateral rather than mutual decisions they are contemporaneous data recorded in the normal course of business. This gives them a certain validity but not accuracy associated with other business records.'*

- To measure delay validly, schedules must be updated regularly. Not necessarily, however, by the as-built method<sup>72</sup>. The Claims Court recognised that the control of the project and the extension of time process is lost if the parties do not properly update the critical path diagram to reflect delays and time extensions<sup>73</sup>.

The next stage is to analyse the scope of the modification to determine which remaining activities will be directly effected, that is, those activities having less work, more work, or other revisions. Revised durations are assigned to reflect the changes.

Where part or all of the changed work does not fit an existing activity a new activity or activities can be created. Logic should be revised if any errors or potential improvements are found.

The revised progress schedule now reflects the remaining work and the modification. Analysis of the schedule will now give the revised completion date.

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<sup>72</sup> C. Ernst v. Koppers Co., 476 F. Supp. 729 (W.D. Pa. 1979).

<sup>73</sup> Ballenger Corp. DOT CAB Nos, 74-32 et al 84-1 BCA ¶ 16,973 (1984) 'the CPM's usefulness as a barometer for measuring time extensions and delay damages is necessarily circumscribed by the extent to which it is employed in an accurate and consistent manner to comport with (suit) the events actually occurring on the job' Continental Consolidated Corp. (ENGBCA 2743, 2766, 67-2 BCA ¶ 6624 (1967)) Where the critical path method of scheduling is used it is essential that any changes in the work and time extension due should be incorporated concurrently with progress information or immediately after to correctly reflect the current status. Fortec Constructors v. United States, 8 Ct. Cl. 490 (1985) The CPM schedule was only updated once and did not consider delays in the work performed prior to or subsequent to the update. Since the critical path can change, items not originally on the critical path can become critical. Accordingly, a schedule used to evaluate delay must be kept current and reflect delays as they occur. The court observed: 'Reliance upon an incomplete and inaccurate CPM to substantiate denial of time extensions is clearly improper. While the contract states that the CPM shall be used to evaluate the impact on the contractors work in determining the allowance of time extensions, it also states that the CPM to be so used must include time revisions. Contract § IC-14(c). Consequently, the contract requires the use of a properly revised and updated CPM to evaluate claims for time extensions.' G M Schup v. United States 5 Ct. Cl. 662, 728-30 (1984) The court stated: *'The reason that the determination of the critical path is crucial to the calculation of delay damages is that only work on the critical path had an impact upon the time in which the project was completed. If work on the critical path was delayed, then the eventual completion date of the project was delayed. Delay involving work not on the critical path generally had no impact on the eventual completion date of the project.'*

The schedule should be revised after each, separate modification. The delay is measured as the difference between the completion dates shown before, ie at the end of the first stage, and after completion of the analysis.

One advantage of this method is that it does not attempt to anticipate future delays (and/or savings in time). Actions are measured by what the parties did, as the situation existed, rather than with the method where early delays by the contractor that may have been overcome by no cost sequence changes or substitutions are, or may be, matched with later unavoidable delays by the owner, to make delayed project completion a non-compensable time extension.

The Update Impact Method accounts for the contractors decisions based upon the situation anticipated at the time of the delay rather than with twenty-twenty hindsight.

#### **2.2.4. Forward Pricing Methods of Analysis**

##### **2.2.4.1. The As-Planned Method**

The As-Planned Method<sup>74</sup>, measures the effect of the delay on the contractors planned performance rather than on actual performance. The various delays are formulated as events with time durations and added to the As-Planned network logic, but without regard as to when the delays actually occurred.

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<sup>74</sup> This is the original methodology developed by A James (Jim) Waldron in the late 1960's. The method was primarily used by contractors presenting claims and after some initial resistance eventually found favour. However when Jim Waldron started to work for clients rather than contractors he realised that this method was, without proper safeguards, likely to produce results which were particularly favourable to the contractor. This led to the development of the method to attempt to balance out the theoretical approach and take account of contractor caused delay.



Applying an isolated set of delays to the As-Planned logic may, at first, seem appealing however Callahan<sup>75</sup> makes the following criticisms of this method:

- Any technique which impacts the As-Planned schedule and ignores the status of the schedule is likely to result in the delaying events being considered out of context and time;
- The logic constraints, durations and consequently the critical path may already have been changed by events other than those under consideration;
- Such an analysis relies on a hypothetical outcome which, at best, only might have been the result and places too much reliance on theory;
- It is often assumed in applying this technique that the claimant is not responsible for any concurrent or critical delays. The schedule may be manipulated by inserting only excusable or compensable delays.

Much of this criticism is accepted by those who would prefer this method and the method has evolved in an attempt to meet the criticisms. By 1984, for example, Waldron<sup>76</sup> had refined his method to incorporate both contractor and employer caused delay.

Notwithstanding these criticisms there are a number of advantages in using this method<sup>77</sup>. This method:

- does not rely exclusively on the existence of As-Built data. An As-Built chart may be used as a cross check and does not necessarily form

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<sup>75</sup> Callahan Michael T, (1991) Delay Analysis (Page 40), Conference Papers.

<sup>76</sup> Waldron A James, (1984) Establishing Liability and Quantum in Delay, Disruption and/or acceleration cause, A lecture paper.

<sup>77</sup> See Pickavance K, (1997) The Proof of Excusable Delay in Building Contracts Without 'As-Built' Records, Article CLJ Vol 13 No 4.

the basis of analysis. In theory the method could be used without any As-Built data other than the actual completion date;

- can produce an answer even where the amount of analysis is limited by time or financial constraints;
- is capable of producing a clear and concise presentation.

The method refined by Waldron requires the following charts be produced:

- As-Planned;
- As-Adjusted owner;
- As-Adjusted contractor;
- As-Built.

The As-Planned chart required here is the same as described above by Wickwire<sup>78</sup>. The As-Adjusted charts are based on the As-Planned chart with owner responsible delays inserted in one version and contractor responsible delays inserted in the other. The As-Built chart is again the same as that described by Wickwire.

The contractor will be entitled to an extension from the end date calculated by the As-Adjusted chart including contractor responsible delays and either the actual completion date or the end date calculated by the As-Adjusted chart including owner responsible delays whichever is the earlier. The end date calculated by the As-Adjusted chart including contractor responsible delays may be later or earlier than the actual completion date. To the extent that the calculated date is later than the

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<sup>78</sup> Wickwire Jon M, Hurlbut Stephen B, Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments, 1974 to 1988.

actual date the contractor has, at least notionally, accelerated the work. To the extent that the calculated date is earlier than the actual date it is likely that the analysis has failed to deal adequately with all causes of delay. A contractor may be content to accept a small under-determination.

#### **2.2.4.2. Net Impact Technique**

The Net Impact technique uses a 'but-for' type of logic and makes some concession in respect of claimant caused delays. The starting point is the As-Planned schedule. Delaying events which the claimant is willing to concede' are inserted into the schedule and a new completion date is calculated. Such concessions are, it is said, likely to be token rather than significant. The technique then assumes that the balance of delays to project completion are the other party's fault. The delays are not quantified but simply described.<sup>79</sup>

#### **2.2.5. Contemporaneous Pricing Methods of Analysis**

##### **2.2.5.1. Modification Impact Evaluation Guide (EP-415-3) (July 1979)<sup>80</sup>**

The Modification Impact Guide provides a detailed procedure for establishing the time and cost impact of contract modifications (variations) 'on the unchanged work'. The following notes are extracted from the guide.

The Guide proceeds on the basis that the original schedule was prepared and approved in accordance with the specification requirements<sup>81</sup>.

It is considered desirable to settle the terms of a contract modification (variation) before a Notice to Proceed (NTP) is issued (paragraph 2-2.).

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<sup>79</sup> Callahan Michael T, (1991) Delay Analysis (Page 50), Conference Papers.

<sup>80</sup> Department of the Army, Office of the Chief of Engineers - 1979.

<sup>81</sup> As noted above these requirements are extensive.



Reasons for failing to reach agreement and alternatives to settlement are considered (paragraph 2-3.).

Knowing the current status of the job is described as being '*absolutely vital to estimating impact*'. The provisions relating to status give an indication of the level of analysis expected (paragraph 3-1.a.).

The current status of the job is determined without reference to the contractors approved schedule. Current status is used because the contractors real plan may be different from the approved plan, or the schedule may not have been revised to reflect the effects of previous modifications. This first step means that the schedule must be updated at the time of the delay and if necessary the plan adjusted to reflect the manner in which the contractor intends to complete the project.

In analysing the current status of the job, accurate data must be compiled on the following (paragraph 3-1.a.):

- Activities completed;
- Activities in progress (including percent complete);
- Activities to start soon (not necessarily from progress schedule)<sup>82</sup>;
- On site manpower (divided into supervisory, administrative, Quality Control (QC), and various crafts; the employer, contractor, subcontractor, and numbers and types employed on each activity in progress must be indicated);
- QC and Quality Assurance (QA) reports must be reviewed to determine production efficiency and past delaying factors;

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<sup>82</sup> Note the anticipatory aspect. See also Callahan above. Presumably reflects the notion that contractors may have their own independent problems with sub-contractors or suppliers. See also the items relating to materials and construction equipment below.

- Materials on site (for future incorporation in the facility); materials submitted, approved, and ordered (anticipated delivery date);
- Materials submitted, approved, but not ordered;
- Materials submitted, disapproved, and not resubmitted;
- Materials not submitted, where approval and procurement lead time is such that they may not be delivered to the site in time to avoid delaying a part of the work;
- Construction equipment and special tools; the status, ie, working or not working, must be indicated. If working, activities for which used must be shown; if not working, whether or not future need exists (indicate specific activity) must be shown.

The preparation and approval of a progress schedule<sup>83</sup> is a requirement of the contract Specification Provisions (paragraph 3-2.a.).

When it approves the contractors progress schedule the Corps of Engineers accepts the information it conveys as defining a practicable way to accomplish the work within the contract completion time. As long as actual progress meets or exceeds that schedule, the originally approved progress schedule remains valid. Very few, if any, construction projects are completed according to the original schedule. Something usually happens along the way that makes the subsequent portion of the original plan undesirable to the contractor, or just plain unworkable. The cause for this may arise from three areas (paragraph 3-2.b.):

- The contractor fails to proceed diligently;

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<sup>83</sup> This is rather confusing terminology as it appears to be referring to the As-Planned programme or schedule rather than the schedule adjusted to reflect actual progress.

- The Corps of Engineers changes the work, gives inaccurate site condition data, fails to take timely actions, etc;
- Delays caused by events defined in the contract as ‘excusable’ delays.

The procedures for developing the time requirements to reflect the changes necessary to accommodate the changed work are summarised at paragraph 3-4. of the Guide. This summary is somewhat confusing and repetitious. The summary is as follows:

- Define current job status. Compile data on actual progress, status of materials, manpower, equipment, and any other pertinent factors (paragraph 3-1.). It is necessary to revise the schedule to show actual job status, including contractor responsibility problems eg the effect of materials not available.
- Analyse the progress schedule. The process of accurately identifying and evaluating impact depends largely on an up-to-date CPM progress schedule. To achieve proper control of the project the Corps believe it is necessary to exercise the authorities and options (of the contractual provisions) to maintain the validity of the progress schedule (paragraph 3-2.). Analyse the scope of the modification to determine which activities will be directly affected; assign revised durations to the affected activity or activities. A new activity or activities should be created if necessary. New durations or activities should be assigned in a way which will least disrupt the remaining work;
- Develop the revised schedule (paragraph 3-3.)
  - Revise the schedule to show actual job status<sup>84</sup>.

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<sup>84</sup> This is apparently the step set out in more detail above under the heading Define current job status above.



- Insert directly changed work<sup>85</sup>.
- Re-calculate affected unchanged work (retaining presently assigned durations).
- Re-establish the critical path, and note time extension justified by direct changes.
- Analyse schedule for impacted unchanged activities; assign new durations to these activities as appropriate.
- Re-establish the critical path, and note any slippage of final completion date indicated in (iii) above. The difference is amount of time extension justified because of impact.

The first stage produces a revised completion date for the project which reflects the current status of the project prior to incorporating the modifications. Any delay between this date and any previous adjustment(s) are, subject to further analysis, contractors responsibility. The second, third and fourth stages calculate the direct effect of the modification(s) on the completion date. The fifth and sixth stages review the remaining activities to adjust for consequential changes and to incorporate any time saving changes which may be available. The allowable delay is the difference between the dates resulting from the first and last stage.

These procedures will result in a logical schedule for the remaining work. Developing the various schedules requires a large amount of judgement. Those making such judgements must have a thorough knowledge of the job site and conditions, the contractors capabilities and methods of operation, the schedule before modification occurred, and the contractual

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<sup>85</sup> This is apparently the step set out in more detail under the heading of Analyse the progress schedule above.

liabilities of the parties. The revised schedule represents one method but not necessarily the only method of completing the remaining work. It has quantified the time considered reasonable, without acceleration, for the contractor to complete the work.

The guide contains worked examples and illustrates the following documents:

- The contractors original schedule - network diagram;
- The contractors original schedule - procurement ladder;
- The contractors original schedule -data listing;
- Progress analysis - network diagram;
- Progress analysis - procurement ladder.

There is also an extensive section dealing with the financial evaluation and charts depicting matters affecting labour production rates.

The Modification Impact Evaluation Guide sets out the method of dealing with delays arising in the course of construction work, primarily as a result of employer generated changes. The associated contract conditions apparently seek to ensure that the time and cost impact of variations are agreed prior to such variations being implemented.

#### **2.2.5.2. The Veterans Administration Method**

The VACPM Handbook<sup>86</sup> sets out the requirements for producing network programmes, progress reporting and delay analysis.

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<sup>86</sup> Veterans Administration Handbook H-08-11 January 1985 Revised May 1986.

According to Callahan<sup>87</sup> the 1985 edition of the VA guide requires both As-Built completion dates and revisions to match actual field construction and therefore more closely resembles the Update Impact Method.

Callahan and Hohns<sup>88</sup> prefer the step-by-step approach of the Corps of Engineers to the VA approach.

This method is similar in its principles to the Corps method. Both proceed on the basis that:

- the original programme will have been prepared and approved in accordance with specification requirements;
- the programme has been updated and the updating approved on a regular basis , in accordance with the specification requirements;
- the impact of potential delays are identified before variations are confirmed.

The contemporaneous pricing of delay is regarded in the US as the most reliable method of analysis.

This method apparently resolves the question of concurrency in favour of the owner. This is achieved by accounting for contractor caused delays in the first stage of the analysis. In practice, however, it is likely that this will simply create an area of debate in relation to the definition of the job status. The preparation of the job status schedule may become hotly contested and may identify potential areas of delay which although owner responsibility may not have been the subject of notice.

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<sup>87</sup> Callahan Michael T, (1991) Delay Analysis (Page 41), Conference Papers.

<sup>88</sup> Callahan Michael T and Hohns H Murray, (1983) Construction Schedules, The Michie Company Law Publishers.



The method also takes full account of any available float to the owners benefit. Although the application of float in this way is inherent in the methodology it is again likely that any debate will simply be moved to the definition of the job status.

This research shows that it is unlikely that the Update Impact methodology could be successfully used for analysis in the UK. There are a number of reasons for this:

- the attitude and approach to planning in the UK generally as set out elsewhere in this work;
- the nature of delaying events which require to be analysed in UK construction contracts. It is usual that delay claims in the UK will be based on a large number of minor events such as variations or late information rather on discrete events or changes. The analysis of numerous minor causes is not practical using this type of analysis because a fresh analysis may be required to consider each cause;
- poor standard of record keeping generally.

#### 2.2.5.3. Time Impact

This analysis examines the delay effects during the progress of the project. The impact of delay on the schedule is determined at different construction stages, the intention being to obtain a 'snapshot picture' of the project before and/or after a major delay impact. The difference between these two dates is deemed as the delay to the project that occurred during the period, the total delay to the project duration being the sum of all delays so identified<sup>89</sup>.

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<sup>89</sup> See Update Impact Method described above. This appears to be simplified version of the Update Impact Method. It appears to seek to achieve the same result but with a much reduced analysis.

#### **2.2.5.4. Snapshot**

Similar to Time Impact<sup>90</sup>.

#### **2.2.6. Hindsight Pricing Methods**

##### **2.2.6.1. As-Built Analysis**

According to Callahan<sup>91</sup> As-Built schedules are the most frequently used, but most misunderstood and misused method of delay analysis. It is said that this method is no more than an attempt to compare planned and actual dates for the same activities<sup>92</sup> and has so many disadvantages and handicaps that affect its reliability, that most serious schedulers limit its use.

The following concerns are raised by commentators and have been found in practice:

- they are costly and time consuming to prepare because of the amount of research which is likely to be necessary to establish actual dates<sup>93</sup>;
- considerable judgement may be required because comprehensive records are rarely available<sup>94</sup>;
- available records rarely correspond to the theoretical activities used in the original network<sup>95</sup>;

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<sup>90</sup> See also Update Impact Method described above.

<sup>91</sup> Callahan Michael T, (1991) Delay Analysis (Page 30), Conference Papers.

<sup>92</sup> This appears to be an unfair criticism where an As-Built network is produced.

<sup>93</sup> This seems to be an unfair criticism. Many of the more sophisticated methodologies require the production of an As-Built chart as part of the analysis.

<sup>94</sup> There are often a number of sources available and these will, likely, produce different dates for the same activities. In construction work activities are often poorly defined and record keeping poor.

<sup>95</sup> This is aggravated by the use of sub-contractors programmes. These are often used by contractors with little effort to produce an overall, unifying, project programme.

- establishing the actual relationships and sequences is extremely difficult if not impossible because such information is rarely recorded<sup>96</sup>;
- sequencing and relationships may have changed from the original schedule<sup>97</sup>;
- the need to exercise so much judgement makes the method prone to manipulation and distortion;
- not capable of easily resolving issues of concurrency<sup>98</sup>;
- there is, in any event, no clearly defined and accepted As-Built methodology.

It is difficult to define a precise methodology as related to the As-Built approach. An As-Built presentation might be used in the following ways:

- identify actual start and finish dates for planned activities, record them, and calculate extended project duration based on originally planned sequence<sup>99</sup>;
- as (a) but using actual sequences;
- as (a) but ignoring sequence, resulting in a detailed bar chart;

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<sup>96</sup> This is not aided by poor activity definition, poor record keeping and the tendency, in practice, for activities to expand to fill the time available for their completion.

<sup>97</sup> Programmes developed during construction seldom bear any relation to the contractors tender programme.

<sup>98</sup> The resolution of concurrency may be largely dependant on the selection of relationships and in particular the identification and selection of effective predecessors to the commencement of any activity.

<sup>99</sup> This appears to be something of a half-way house using an original network with actual durations. Would produce a theoretical answer which may or may not coincide with the actual completion date.



- where the schedule has been updated regularly, compare the last monthly update to the initial planned schedule;
- impacting an As-Built network by depicting delaying events as distinct activities and tie them to specific work activities by restraints. The critical path is determined only twice, once in the As-Planned schedule and again at the end of the project. Claimants invariably attach delays caused by the other party to the critical path.

Because the As-Built schedule focuses on actual progress to define the critical path and to show which delays impacted project completion it may be suitable where only one party contributed to the delays.

Even if an As-Built chart or analysis were not capable of demonstrating delay as a stand-alone method the As-Built chart is an essential part of most of the hindsight pricing methods. Much of what is currently produced in the UK would amount to little more than an As-Built chart.

#### **2.2.6.2. Collapsed As-Built Method**

This is an extension of the As-Built method. This method is very similar to the But-For approach.

When the As-Built network incorporates delaying events as separate activities and multiple parties are involved one approach to analysis is to collapse the schedule by removing the delays in stages. The delays caused by each party are removed in stages, the resultant completion date is allegedly the date the project would have been completed absent other party delays.

The collapsed As-Built method suffers from the following problems:

- the durations of delays are often arbitrarily established;

- the extraction process is prone to manipulation;
- the total of all delays when added together may be greater than the overall delay.

#### 2.2.6.3. The But-For Method

Both owners and contractors have used a but-for variation of the global technique. Each party's analysis will identify and remove its own delays. The analysis proceeds on the basis that despite its own delays the other party would have been delayed by its own actions. The owner, for example, after removing his own delays assumes that the remaining delays are the contractors responsibility.

It is not unusual that delays caused by both parties would, on their own, be sufficient to account for the whole delay. As described here<sup>100</sup> this appears to be more of an approach to the matter of concurrency than a separate methodology.

Alkass and Harris<sup>101</sup> provide a different description for this method. It appears to be almost a complete mirror of the method described by Callahan. With this technique, all delays for which one party bears responsibility are shown on the As-Built schedule, and then compared to the As-Planned. The difference between the resulting completion date and the original completion date is the time that the party will demand for extension.

Rather than only taking out the delays caused by one party only the delays caused by one party are included.

#### 2.2.6.4. The Global Method

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<sup>100</sup> Callahan Michael T, (1991) Delay Analysis (Page 50), Conference Papers.

<sup>101</sup> Alkass Sabah and Harris Frank, (1991) Expert Systems Construction contractor's claims analysis: an integrated approach, Article Building Research and Information Volume 19 Number 1.

The global method is easy to present but often an inaccurate method of depicting the impact of delay causing events<sup>102</sup>. The total delay to the project is purported to be the sum of the durations of all the delaying events without any account being taken of the particular effect of any individual delay. Shortcomings of the method include<sup>103</sup>:

- does not demonstrate that any particular delay impacted the overall project completion;
- presumes that all delays automatically delay project completion;
- often makes no attempt to adjust for errors in the original schedule;
- fails to address concurrency and can consequentially result in a claim for time extensions way beyond the actual completion date;
- Alternatively it may be said that the method can demonstrate acceleration.

The description provided by Alkass and Harris<sup>104</sup> is again slightly different. They say that in using this technique, all the delays are simply plotted on a summary bar chart. The total delay to the project is assumed to be the sum total of the durations of all individual delay durations.

Although the descriptions are slightly different the overall effect appears to be the same. All the activities, both original and delay activities, are plotted on a single chart. The total duration of all delays is totalled and added to the original completion date. The difference between the original completion date and the 'justifiable' completion date is claimed

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<sup>102</sup> Callahan Michael T, (1991) Delay Analysis, Conference Papers (Page 46).

<sup>103</sup> Callahan Michael T, (1991) Delay Analysis, Conference Papers (Page 46).

<sup>104</sup> Alkass Sabah and Harris Frank, (1991) Expert Systems Construction contractor's claims analysis: an integrated approach, Article Building Research and Information Volume 19 Number 1.



to be the measure of improvement achieved by acceleration. There is no critical path analysis or any pretence to the criticality of individual delays.

This method would not be a suitable contender for use in the UK because it could not meet the evidential criteria already established by decided cases.

#### **2.2.6.5. Global Impact with Concurrency Resolved**

This technique is similar in its characteristics to the Global Impact Method except that delay is only claimed up to the original completion date. Using this technique only the net effect of all delays including concurrent delays are plotted on a bar chart based on the As-Built schedule. The claims analyst aims to obtain an extension of time for the entire delay period from original contract completion to actual completion of the work.

Again there is no critical path analysis or any pretence to the criticality of individual delays. There is no direct link between the individual delays plotted on the chart and the overall delay to the date for completion.

Although not identified as a distinct methodology many claims pursued in the UK are pursued on the basis of a form of analysis which fits this general description.

This method would not be a suitable contender for use in the UK because it could not meet the evidential criteria already established by decided cases and, in particular, this method would not be capable of demonstrating that any delay was on the critical path.

#### **2.2.6.6. Value Ratio Method**

There are a variety of methods to prove delay, some being based on the economics of trial preparation rather than sound principles of schedule analysis.

One such method is based on the ratio of the value of changes to time. This is argued on the basis that the cost of the additional work correlates with the extended duration required to perform it. Otherwise known as the 'Prorata' method.

#### **2.2.6.7. Boundary Curves**

This method uses boundary curves<sup>105</sup> to resolve broad based delay claims. A graph is produced showing curves in respect of As-Planned early start dates, As-Planned late finish dates, As-Built start dates and As-Built finish dates. Each curve is constructed by plotting the cumulative percentage of activities starting (or finishing) in each month on the vertical axis against contract time, in months, on the horizontal axis.

Although of little probative value the method can be used to give an indication of areas of a project performance which should be examined in more detail or to summarise/demonstrate the results of a more detailed exercise<sup>106</sup>.

In the case given as an example the electrical sub-contractor complained that he had not been given access to working areas to enable him to progress his work. By comparing the performance of main contractor and electrical sub-contractor in some detail, apparently using fragnets, it was concluded that the main contractor had provided the necessary work areas

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<sup>105</sup> The boundary curves are constructed in graphical form from data relating to the planned and actual start and finish activity dates.

<sup>106</sup> Werderitsch Anthony J, (1984) PE Project Management Associates Inc., Analysis of Broad-Based Delay/Impact Claims, Article Project Management Associates Inc.

to the electrical sub-contractor. To avoid having to present a complicated analysis to a three man arbitral tribunal it was decided to use boundary curves to give an overall impression of main contractor and electrical sub-contractor performance.

The curves do not indicate which activities were starting or finishing in any particular month. An accurate reflection must depend upon the activities containing roughly equal quantities of work.

The method appears to have been accepted as a suitable form of summarising/demonstrating the results of a more complex form of analysis.

#### **2.2.6.8. Windows and Fragnets**

Fragnets and windows are techniques for looking at individual segments of CPM networks<sup>107</sup> rather than an independent method of analysis.

Fragnets are sub-networks, used to break one or more activity shown on a CPM into a finer level of detail.

Window analyses focus on the effects of delays in specific periods by looking at the gains and losses to the critical path as they occur within each update period.

#### **2.2.7. Summary of Section 2.2**

There is a choice of conceptual approach. The analysis may be carried out on a basis which takes a prospective, contemporaneous or retrospective view of the impact. Whilst the US has tended to prefer the contemporaneous and retrospective approaches it may be necessary for

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<sup>107</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.



the UK to develop an approach by starting with the prospective approach.

It is an established principle that delay should be measured as the impact on the project completion date not on the basis of a comparison of planned and actual dates for individual activities. This principle is clearly put in the work of both Callahan and Hohns and Wickwire and Smith. See also the decision in Schup v US<sup>108</sup>.

There are a number of methodologies to chose from. It is suggested that those which are not based upon the use of network techniques are unlikely to assist in the development of a suitable approach for use in the UK. This is because the data required for such an analysis is extensive and can only be realistically handled by using computer based project management software. A proper analysis will also require the identification of the critical path which identification is best achieved using computer techniques.

The basic principle of the various methods is that two models are required one showing how the project could have been constructed, the baseline programme<sup>109</sup>, one showing how the project was constructed, the adjusted programme<sup>110</sup>.

There appear to be alternative ways of arriving at each model.

The baseline may be the contractors original programme it may be calculated from first principles after the event or it may be a de-impacted As-Built programme.

The adjusted programme may be:

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<sup>108</sup> G M Schup v. United States 5 Ct. Cl. 662, 728-30 (1984).

<sup>109</sup> This may be a single programme or a series of programmes reflecting project status at a number of key points.

<sup>110</sup> May also be single or a series.

- the final update of the contract programme;
- an As-Scheduled programme with actual or theoretical delays added;
- As-Built programme prepared after the event using project records.

The adjusted programme should reflect, as closely as possible, what actually happened on site.

### 2.3. The Development of Schedule Impact Analysis Using Computer Scheduling Techniques in the UK

The author first became aware of the technique of schedule impact analysis in November 1989. Despite being actively involved in the presentation and analysis of time claims for some years the author had not previously encountered, as a separate and definable methodology, the technique of schedule impact analysis.

During the final preparations for a hearing in Paris, of a dispute which included a substantial delay claim, just hours before the hearing was due to start, the expert evidence for the Claimant was produced. This evidence was extremely late and ought to have been served weeks earlier.

The written evidence, the charts and data listings referred to were not at that stage available, made reference to the technique of schedule impact analysis and the experts' extensive expertise in that area. The Claimant's expert was a practitioner from the US.

The analysis was prospective and used the As-Planned methodology. The analysis was based on a computerised version of the contractors original hand-drawn CPM. The issue dates for a number of key variations had been imposed together with theoretical lead times. These adjustments indicated an entitlement, according to the Claimant, way beyond the actual completion date. The analysis itself was, for a number of reasons,

of limited effect but the need to understand the methodology was unavoidable.

Enquiries about schedule impact analysis revealed no ready source of material in the UK. Further research identified a US paper entitled **The use of Critical Path Techniques in Contract Claims**<sup>111</sup>. As will be seen from Section 2.2 this same paper was taken as a convenient starting point for the analysis of UK practice. For that reason there is a limited amount of overlap in the early part of Sections 2.2 and 2.3 of this Chapter.

This paper, although of some age, appeared to provide a clear outline of the techniques and the way in which they are applied in the US.

On a first reading this paper, in addition to providing a clear understanding of the techniques, appeared to provide an answer to many of the problems faced in the UK in prosecuting time related construction claims. At the beginning the paper makes the following statements regarding the techniques:

*'The use of CPM techniques in contract claims provides greater visibility into the facts which make up a construction project.'*

*'Aids understanding of the interrelationship of:*

*concurrent delay, on and off the critical path;*

*questions of cause and effect and liability.'*

*'The use of CPM creates more practical and legal issues which require to be resolved but also provide the tools with which to resolve these issues.'*

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<sup>111</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974. This paper was developed from the ideas of Jim Waldron who had been introduced to Jon Wickwire by Howard Gleason in 1972.



These comments offer both the promise of assistance in areas of much interest and debate and a warning of potential areas of difficulty.

A subsequent paper in 1989 by the same authors **Use of Critical Path Method Techniques in Contract Claims: Issues and Developments, 1974 to 1988**<sup>112</sup> sought to review the developments over that period and examine whether the expectations set out in the earlier work had been fulfilled. The conclusion of that subsequent paper was:

*'The techniques and principles described in the original article have gained widespread acceptance. The article and the views expressed therein have been cited as authority in a number of cases.'*

From a full reading of these two articles it can be seen that the techniques are:

- well established;
- developing over a period of some years.

Other articles and cases during that period and subsequently continue and extend the development.

Both of the Wickwire articles, in common with many similar US articles, quote a number of cases as source for the commentary. Details of those cases quoted indicate that:

- construction claims are reviewed by US courts in far more detail than is the case in the UK;

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<sup>112</sup> Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) **Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988**, Article Public Contract Law Journal.

- the way in which both the construction planning process and the resultant programmes are viewed is quite different from what is found in the UK.

In the US those trying time and other construction disputes are clearly specialists who are quite happy to work through, for example, the detail of complex network programmes. Amongst the cases can be found commentary on just about every aspect of construction planning.

This factor may be explained by the real difference in both the approach to the process of planning and the contractual status of the resultant programmes which is evident in the US case reports and articles. By contrast to the quite relaxed attitude to producing construction programmes which is found in the UK, US contractors are:

- more likely to produce programmes using the Critical Path Method;
- more likely to produce a comprehensive detailed programme before commencement of construction work;
- more likely to progress, maintain and adjust the programme to reflect actual performance and changed circumstances;
- more likely to have resolved responsibility for delay on a prospective basis.

In the US the contractors original programme will probably, although often this is an area of heated debate, be a contract document<sup>113</sup>. And further the detailed contents of the programme will likely, again maybe only after a bitter debate, be agreed between the contractor and the employer. Therefore this programme is the obvious starting point in any

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<sup>113</sup> The impact of this on contract performance generally is beyond the scope of this work. Although the programme may be a contract document this does not automatically mean that a contractor will be in breach if he departs from it. See the commentary above at paragraph 2.2.

analysis. This is in marked contrast to UK practice<sup>114</sup>. Generally, neither contractors nor employers are anxious to have programmes incorporated in construction contracts. Sub-contractors appear more anxious to incorporate programmes into sub-contracts but contractors not. On balance sub-contractors want the certainty of fixed start and finish dates and also an indication of when areas of work will be available to them, when those areas are to be released to other trades and what other work, if any, will be proceeding at the same time as their own. Contractors are reluctant to provide this level of detail because they apparently believe that it will constitute a commitment which they may be unable to meet and thus give the sub-contractor an easy opportunity to make claims.

UK law takes the view that a contractor, or sub contractor is not entitled to rely on any programme which is not a contractual document. See for example the decision in **Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical**<sup>115</sup> where HH Judge John Newy QC declined to construe the contract in a way so as to incorporate a programme.

This basic difference in approach and its effect on the status afforded to construction programmes may yet defeat attempts to make full use of the sophisticated techniques and methodology used in the US<sup>116</sup>.

In the last 5 years there have been a number of publications in the UK which have considered the subject of Schedule Impact Analysis. Where these works deal with the methods of analysis they add little or nothing to that which can be obtained from US literature. The works are reviewed here with particular reference to;

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<sup>114</sup> See Pickavance K, (1997) *Delay and Disruption in Construction Contracts* (page 114), LLP. 'A number of legal commentators in the UK have been quite dismissive of the role of the programme in considering EOT's.'

<sup>115</sup> **Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical**. (1989) 6-CLD-02-07 (Q.B. 1989) as set out more fully below in Section 5 of his Chapter.

<sup>116</sup> See also See Pickavance K, (1997) *Delay and Disruption in Construction Contracts* (page 315), LLP.



- indicators of the way in which the methods of analysis have, or may be applied to the analysis of delay claims in the UK; and
- whether they support the contrast between the approach to construction planning found in the USA and UK suggested above:

### 2.3.1. Fenwick-Elliott - Building Contract Litigation<sup>117</sup>.

This book contains a section entitled Retrospective Delay Analysis which deals with the proof of delay claims.

The approach taken in this book to the identification of a methodology is to look at first principles rather than consider, for example, the methods in current use in the USA. The result is a process which approximates best to the retrospective methodology. The factors which the book's author considers to be important are:

- the need to identify delays which are on the critical path;
- the need to establish the actual logic. This is necessary because the original logic will have changed;
- the need to explain what actually happened on the project, identify all new activities, changes in activity durations and changes in logic. The time analysis should show whether the changes are critical or not;

There is the suggestion that courts and arbitrators will assume that the contract would have been performed to the contract programme unless the contrary is demonstrated. This comment is unsupported and does not appear to be consistent with the decided cases which tend to adopt the opposite presumption<sup>118</sup>.

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<sup>117</sup> Fenwick-Elliott R J, (1993) Building Contract Litigation, Longman.

<sup>118</sup> See for example the decisions in Kitson and Pigott discussed below.

The definition of what constitutes a good analysis is:

- A good analysis is one which provides a comprehensive explanation of what happened on the project. This is typified by the production of two charts or a single chart containing two [sets of] bars:
  - one showing what actually happened on site, as a matter of historical record, without any calculation or manipulation at all;
  - the second the result of the analysts time analysis. This analysis should be free of any artificial, imposed constraints.

If these two charts more or less marry up then the analyst has succeeded in putting forward a credible explanation of what happened on site;

- A good analysis will have a fall back position. This may or may not be possible, the analyst cannot produce delays which do not exist;
- A good analysis is something which a sensible advocate can explain;
- A good analysis will always trace through the effect on the completion date, if any, of every matter complained of.

The need to explain the actual logic and what actually happened in fact would tend to rule out the both the prospective and contemporaneous approaches. The prospective analysis is unconstrained and may produce a completion date beyond the actual completion date. The delay(s) established by the contemporaneous approach cannot be reconciled against the As-Built data as each delay has been calculated on a prospective basis.

Either the contemporaneous or the retrospective approach might meet the requirements to demonstrate the impact on completion.

However, the requirement to match actual performance and explain all delaying events can only be met by the retrospective approach. The contemporaneous approach would not meet either the requirement to match actual performance or to include and explain all delays.

### **2.3.2. Keane - A Computer-Aided Systematic Approach to Time Delay Analysis for Extension of Time Claims on Construction Projects<sup>119</sup>.**

The thesis develops a proposal for an approach to the proof of delay claims. The result is a proposal which incorporates the contemporaneous approach. The requirements against which the adequacy of the approach should be measured are give as follows<sup>120</sup>:

- Identification of each causative event resulting in critical delay;
- Provision of material evidence to support the existence of each causative event.
- Identification of the critical delay caused by each causative event.
- Provision of material evidence demonstrating the direct link between causative event and critical delay.
- Analytical capability to neutralise the effects of Contractors own culpable delaying events.
- Identification of contractual and/or legal basis for critical delay claim.
- Capability of presenting claim assessment findings and unambiguous format.

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<sup>119</sup> Keane P J, (1994) A Computer-Aided Systematic Approach to Time Delay Analysis for Extension of Time Claims on Construction Projects, PhD Thesis.

<sup>120</sup> Keane P J, (1994) Supra. Paragraph 5.2.2.



It is not clear how these requirements have been established, neither is it clear how these requirements are said to suggest or dictate the use of the contemporaneous approach. The explanation of the choice appears to be at page 165:

*'The principle involved during this exercise was to reflect or recreate through the computer based programme model the critical effect of the causative events as they occurred during the project.'*

*The significant difference with the CoSTAR technique was to conduct this simulation taking fully into account the actual status of the progress on site at the time the alleged causative event had its effect. The purpose being to remove or neutralise the effects of Contractor's progress such that they would not benefit in the calculation of critical delay as a result of delays of their own making.'*

The research carried out as part of this work would tend to confirm the validity of the requirements but would not support the contention, if it were being made, that the contemporaneous approach was the only or even the best approach to achieve them.

### **2.3.3. Pickavance - Delay and Disruption in Construction Contracts.<sup>121</sup>**

This book is principally concerned with the proof of delay claims.

The book makes much of the decision in **John Barker Construction Limited v. Portman Hotel Limited**<sup>122</sup>. At page 302 Pickavance notes that the CPM analysis put in evidence in that case was accepted by the judge, but modestly fails to note that it was his analysis. Later at page 318

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<sup>121</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts, LLP.

<sup>122</sup> John Barker Construction Limited v. Portman Hotel Limited (1996) 12 Const L J 277 and (1996) CILL 1152.

Pickavance confirms that the analysis accepted by the court was an As-Planned form of analysis<sup>123</sup>. This case is indeed unique, being the first in which the use of a CPM analysis was approved<sup>124</sup>.

Generally, the book asserts US standards as absolute without justification. The book lists some 293 cases. Of these 38 are cases which have been reported since 1991 and of those only 5 have any direct bearing on the approach to time analysis.

The book sets out a number of methods of calculating delay and tends to discuss their merits or otherwise without favour. Most of the descriptions of the various methods are recognisably taken from US literature.

There is some divergence between the general principles espoused by Pickavance and the more detailed descriptions of the various methods.

Pickavance says that, in principle, programme-based proofs rely on a comparison of the As-Planned data with the As-Built data with a view to identifying and apportioning responsibility for the differences between the two. This is consistent with the retrospective approach to analysis and the approach favoured by Fenwick-Elliott<sup>125</sup>.

The general process of analysis is described as follows:

- check and verify the Master Programme as a reasonable method of construction;
- check and verify the As-Built Programme;

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<sup>123</sup> This is further confirmed in an article produce by Pickavance (1997) entitled The Proof of Excusable Delay in Building Contracts Without 'As-Built' Records, CLJ Vol 13 No 4 (pages 243-252).

<sup>124</sup> It has, however, been suggested that the judge in *Barker* was not one of the usual ORs who normally try construction cases and that they may well have come to a different view of the analysis presented.

<sup>125</sup> Fenwick-Elliott R J, (1993) Building Contract Litigation, Longman.

- develop a comprehensive listing of all changes or unanticipated events that occurred during the project and relate those impacts to specific points in time;
- calculate the effects of the variances in work sequence, activities and durations, manpower and resources on the Master Programme;
- prepare a complete written description of each major change or event;
- review the contract documents to confirm that the change or unanticipated event is compensable and/or excusable; and write up the contractual bases for alleging excusable and compensable delay.

This process is consistent with the retrospective approach.

However the later sections of the book deal with various techniques in some detail and a number of issues relevant to the choice of approach emerge.

#### **2.3.3.1. As-Planned Impacted**

This is a prospective form of analysis. This is the form of analysis approved in **Barker**.

It is suggested that this method is of very limited use. The reasons given are:

- its basis must be a programme which is relevant to the contractor's intentions at the time the event occurs; and
- the effects of the events imposed are theoretical.



These criticisms seem to be misplaced. The As-Planned method does not consider the question of whether the programme is relevant at the date of the event. This is because it is a theoretical exercise.

The use of theoretical impacting events is a deficiency which is a common feature of both the prospective and contemporaneous<sup>126</sup> approaches.

Pickavance says that it is the theoretical nature of the impacting events which is the most serious problem. This he goes on to say is not a problem for the As-Built method which *'requires relevant current material to be taken into account'*.

Although there may be a trend in the USA away from the As-Planned method it is still widely used by practitioners.

Pickavance suggests that the prospective methods tend to work well on smaller contracts and with larger contracts where the number of impacts is limited.

#### 2.3.3.2. As-Built-But For

This is a retrospective form of analysis.

This analysis is said to be more difficult to perform than the As-Planned. Simulating the as-built sequence and durations in a free flowing network is a major task<sup>127</sup>. Pickavance identifies the practical difficulties in completing an As-Built critical path analysis.

The method can be based on the actual build times and is capable of establishing both the period of excusable and the period of excusable, compensable delay.

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<sup>126</sup> The Snapshot technique described later by Pickavance is a contemporaneous approach.

<sup>127</sup> This is a view shared by most commentators and confirmed in this research.

Two drawbacks to this method are noted:

- The first is a suggestion that the analysis may be open to manipulation by, for example, the contractor not removing all the delays for which he is responsible.
- The second is that the As-Built critical path will only hold good for the final picture. Consideration *may* need to be given to the location of the critical path at the time a delaying event occurred (emphasis supplied).

So far as manipulation is concerned any form of analysis can be produced in a biased way. It is for the analysts to ensure that, as far as is possible, the analysis is fair and balanced. The most effective way of ensuring balance is to produce an analysis which accounts for all differences between planned and actual performance. It is for the analysts then to establish which delays are significant, which are on the critical path and which if any are concurrent. No particular method can guarantee the absence of bias without ensuring that all relevant matters are properly reflected.

Pickavance says, by way of criticism, that the critical path obtained is the one which only holds good for the final picture and that consideration *may* need to be given to the location of the critical path at the time a delaying event occurred. The use of the word *may* suggests that this requirement is conditional. The conditions in which the *may* would become operative are not, however, explained. (Emphasis added.)

#### 2.3.3.3. Window Analysis

Pickavance says that window analysis is a technique which can be carried out by any method. This means it is a technique which can be taken whether the analysis is being carried out on the prospective, contemporaneous or retrospective basis.

The comments are therefore of no interest in respect of an analysis relative the merits of the various bases.

#### 2.3.3.4. Snapshot Analysis

The method of analysis described here is the contemporaneous approach. The use of the description Snapshot to refer exclusively to the contemporaneous approach is not consistent with normal usage. The Snapshot technique is one which can be used with any of the three approaches. The reference to the decision in **McAlpine Humberoak**<sup>128</sup> is not understood. It is difficult to see how the case and in particular the citation from the judgment can be taken as support for any particular approach. The case highlights the need to adopt an analytical approach. Pickavance suggests that there are three aspects which the Snapshot technique allows but which tend to be unavailable with other methods:

- the actual state of progress at the time the delaying event occurred;
- the changing nature of the critical path as a result of the events; and
- the effect of action taken, or which should reasonably been taken, to minimise delays or avoid subsequent delays.

The conceptual or other basis for the assertion that the actual state of progress at the time of the delaying event is relevant is not articulated. This research has identified that these notions are derived from US cases. The relevant cases are reviewed and repeated in the work of Callahan<sup>129</sup> and are discussed above in Section 2.2 of this Chapter.

The changing nature of the critical path as a result of the delaying events is, to a large extent, a matter which has to do with the concept of

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<sup>128</sup> **McAlpine Humberoak Ltd v. McDermott International Inc (No 1)** (CA 1992) 24 ConLR 68.

<sup>129</sup> Callahan Michael T, (1991) Delay Analysis, Conference Papers.



concurrency. The snapshot approach would take a fixed view of such matters.

The question of mitigation should always be considered. Again, however, each of the approaches can accommodate a review of whether or not the contractor could have avoided or reduced delay by re-sequencing the work or employing increased or alternative resources or methods.

Pickavance says that the contemporaneous approach might work best on small projects where the project programme has experienced a limited number of delays and that the approach has size as a practical limitation. It is also asserted by Pickavance that this approach is the only way in which the true effect of an event can be analysed to take account of all its consequential effects and matters of concurrency. This is entirely misconceived. The suggestion that the full consequential effects of an event can be established by the prospective view taken at the date the event occurred, whatever that might mean, is unrealistic. The effects of concurrency can be tested and accommodated in the prospective, contemporaneous or retrospective approaches.

It is to be assumed that the enthusiasm for the contemporaneous approach is rooted in the entirely laudable sentiment that delay claims should be resolved as they occur rather than being left to be resolved after the event.

#### **2.3.4. Eggleston - Liquidated Damages and Extensions of Time.<sup>130</sup>**

The title of this book looks promising in the context of the subject under review. The book, however, contains little of assistance in establishing the proper approach to the measurement of time claims. It does however included the following observation:

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<sup>130</sup> Eggleston Brian, (1997) *Liquidated Damages and Extensions of Time in Construction Contracts*. (Second Edition), Blackwell Science.

*'Much of the case law relating to the procedures for extending time concerns the alleged non-observance of particular rules and is of only limited assistance in setting general guidelines. That may account for the fact that there is a great deal of variability and unpredictability in awards of extension of time.'* That view is consistent with this research.

In dealing with concurrency Eggleston makes the important point that the approach which is necessary in respect of an extension of time for relief from liquidated damages may be different to the approach required to establish an entitlement to delay related loss and/or expense.

Eggleston says that *'it is the relationship of extensions of time to claims for loss and expense or extra cost which causes most difficulties with concurrent delays'*.

In many cases the approach to concurrency can be derived from the contractual provisions. Thus the wording of the JCT 80 Standard Form of Contract, arguably, allows the contractor an extension of time where a delaying event has occurred whether there has been concurrent delay by the contractor or not.

Application of the separate provisions relating to compensation, which do not exclude the concept of concurrent causes, is likely to result in the contractor being compensated for a lesser period. Even if this distinction is not drawn in the contractual provisions it is likely to be raised by one or other of the parties to a dispute in order to maximise its position

#### **2.3.5. Bordoli and Baldwin - A Methodology for Assessing Construction Project Delays.<sup>131</sup>**

An article which proposes an approach to the proof of delay claims.

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<sup>131</sup> Bordoli D W and Baldwin A N, (1998) A Methodology for Assessing Construction Project Delays, Article Construction Management and Economics.

The article does two things. It reports on a survey in respect of the methods of delay analysis in current use and proposes an approach for the future. The two elements of the work appear to be pulling in opposite directions.

The overwhelming conclusion of the survey is that if any methodology could be identified as being in common usage it was the retrospective, As-Built form of analysis.

It is therefore surprising that the recommendation for a future approach is one which is at its furthest from the current position as it could be, both in terms of conceptual approach and as a matter of practical application.

The results of the survey are consistent with this research. That the As-Built approach is the most common is without surprise. It is surprising, however, that such a large proportion<sup>132</sup> of the respondents apparently claim to have used an As-Built network to analyse delays.

It is difficult to reconcile the results of the survey which indicate both a preference and an implicit degree of acceptance of the retrospective approach with the commitment to the contemporaneous approach.

The article asserts that there are three important aspects of delay analysis which are not addressed by the techniques in current use:

- The progress of the project at the time the delaying event occurred. An event, when viewed with regard to the baseline network, may have a potential effect. However, if the actual progress of the project at the time the event occurred is less than that scheduled, the event may no longer affect the completion date.

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<sup>132</sup> According to the results of the survey 60% of the respondents use or had used an As-Built network to analyse delays. The number who used project management and programming software to analyse delays is said to be 79%.



- The changing nature of the critical path. Only events that effect activities on or near the critical path will have an effect on the project completion date. It is likely, taking account of project progress and the effect of previous events, that the critical path will change during the life of the project. The effect of current events must therefore be assessed against the critical path of the project at the time the event occurred.
- The effects of the action taken, or that should have been taken, to minimise potential delays. In most standard forms of contract there is an express provision that the contractor should take action to reduce the effect of delaying events whoever is responsible for the delay. This duty is also a general obligation under common law. The effects of the action proposed to be taken or that which the prudent contractor should have taken (or retrospectively the action that was taken) must be incorporated.

There is no indication as to how the importance of these factor has been identified. Their derivation is not, apparently, attributed to the source material identified in the references or to the survey results. They do however show a marked resemblance to the factors asserted by Pickavance and the comments made above in this respect hold good here.

#### **2.3.6. Summary of Section 2.3**

In the UK publications there is support for the contemporaneous and retrospective approaches:

- The method of analysis which is most widely used in the UK at present is the As-Built retrospective approach.
- The retrospective approach is favoured by Fenwick-Elliott. That preference is based on considerations of first principles. Pickavance in his analysis of basic principles sides with the retrospective approach.

- Keane and Bordoli and Baldwin<sup>133</sup> have chosen the contemporaneous approach. Pickavance<sup>134</sup> expresses some support for the concept of contemporaneous analysis.

This research indicates that the retrospective approach is the most suitable approach for use in the UK. This approach is consistent with the approach to delay analysis in current use in the UK and it is anticipated that this approach will provide a good fit with the appropriate principles of law. Given the approach to construction planning found in the UK and the extent of shortfall of the information which is required to achieve a proper contemporaneous analysis, it is anticipated that the contemporaneous approach will not be capable of providing consistent results.

Before proceeding to discuss the shortcomings of the contemporaneous approach it is worth summarising the development of delay analysis in the US. In the US the prospective approach was developed first. In use, this approach was found to favour contractors. The approach was subsequently modified to accommodate contractor caused delay. The contemporaneous approach was developed from the prospective approach by the introduction of further safeguards and in particular the requirement to account for the status of progress on the project at the time of the delaying event. The retrospective approach was also developed from the prospective. By using actual performance data as its starting point the retrospective approach avoids the need for the elaborate safeguards necessarily introduced into the contemporaneous methods.

There are a number of problems with the contemporaneous approach and the commentators who would support its use appear to have misunderstood some of its features:

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<sup>133</sup> Bordoli D W and Baldwin A N, (1998) A Methodology for Assessing Construction Project Delays, Article Construction Management and Economics.

<sup>134</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts, LLP.



- The contemporaneous approach calculates the delay entitlement on the basis of what *might* happen as opposed to what actually happened in fact and takes a prospective view of the future. Subsequent adjustment in respect of actual performance will not correct any past miscalculation of entitlement;
- Because the contemporaneous approach takes a prospective view of the future, elaborate safeguards have been incorporated into the process. Where this approach is used during project execution and/or in pursuance of the contract, the parties will have elected to take this approach in the full knowledge of the potential shortcomings and the safeguards required. The contract will include stringent requirements for establishing the proper status of the project<sup>135</sup>, including matters of the contractors performance failures<sup>136</sup>. The safeguards have the effect of making the prospective analysis of a potential change represent as closely as possible what is likely to happen in the future, in effect seeking to anticipate the as-built position<sup>137</sup>.

It is wrong to misinterpret the safeguards exclusively required for the contemporaneous approach as fundamental principles applicable to all forms to delay analysis;

- This research would suggest that without rigorously policed contractual obligations on contractors to release the sort of

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<sup>135</sup> See for example the 'Modification Impact Evaluation Guide' as used in the USA. Department of the Army, Office of the Chief of Engineers - 1979. The detailed and exhaustive conditions for such an analysis are set out in full in Section 2.2 above.

<sup>136</sup> Properly applied the method will take account of contractor performance failures which have caused delay in the past and those which have already occurred but may cause delay in the future. Matters which will cause future delay would include, among other things, late order of material, late appointment of sub-contractors and poor performance standards generally. Incorporation of these 'latent' problems is necessary to protect the Employer.

<sup>137</sup> The contemporaneous approach is seeking to emulate the certainty of the retrospective analysis so that matters of delay can be resolved 'contemporaneously' rather than 'retrospectively'. The questions of extension of time are resolved as the project proceeds and both the employer and contractor can plan accordingly. By using the contemporaneous approach conceptual rigor is sacrificed in favour of short term certainty.



information which would be necessary to complete a proper assessment of project status, such information will not be made available<sup>138</sup>. Adequate safeguards would be required if this approach were to be used after the event. It is difficult to see how matters which effectively only exist in the mind of the contractors staff can be established after the event;

- The contemporaneous approach takes a fixed view of concurrency. Where the approach to concurrency for extension of time for relief from liquidated damages is different to the approach to be applied in respect of loss and/or expense, separate analyses will be required;
- None of the commentators who would espouse the contemporaneous approach explain what they mean by the expression '*the time at which the delaying event occurred*'. Does this mean:
  - the date when the seeds of the event were sown;
  - the date at which the contractor was first aware of the event;
  - if the event was a employer ordered change or variation, the date upon which the contractor's became contractually obliged to carry out the change or variation;
  - the date the changed or varied work commenced; or
  - the date the delay commenced.

The status of the work and the potential for impact may be quite different on each of these dates. Clearly after the first date has passed the

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<sup>138</sup> Failure on the part of the contractor to produce this information in a full and open way introduces the risk that the result of the analysis would be one-sided. Thus the contractor may, by use of this approach, obtain an extension of time for a matter which in the fullness of time is found not to be critical because of some other delay. That other delay may well have been incipient at, or before, the analysis date.

contractor may change his approach to the work in either a positive or negative way insofar as the potential impact of the change is concerned.

Before seeking to narrow the choice of approach it is appropriate to consider in more detail the concept of causation and the associated legal principles which underlie the grant of an extension of time and the question of concurrency.

### 2.3.7. Causation

The principles of causation which underlie the calculation of the period of delay can, for the purposes of this exercise, be considered to be parallel to the principles which underlie the calculation of damages.

The principles which relate to damages can be identified by reviewing the explanations provided by the Courts. Keating<sup>139</sup> sets out the following explanation which relates to contractual breach:

*'Where a party sustains a loss by reason of a breach of contract, he is, so far as money can do it, to be placed in the same situation with regard to damages, as if the contract had been performed'*<sup>140</sup>;

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<sup>139</sup> May Anthony J, (1995) QC, Keating on Construction Contracts (6th Edition) (pages 200 and 201).

<sup>140</sup> Robinson v. Harman (1848) 1 Ex. 850 at 855, said by Lord Pearce to be *'the underlying rule of the common law'*, Koufos v. Czarnikow Ltd [1969] 1 A.C. 350 at 414 (H.L.); British Westinghouse v. Underground Electric Railways [1912] A.C. 673 at 689 (H.L.); see also The Albazero [1977] A.C. 774 at 841 (H.L.); Johnson v. Agnew [1980] A.C. 367 at 400 (H.L.); Bevan Investments v. Blackhall & Struthers (1977) 11 BLR 78 at 95 (New Zealand Court of Appeal). Where the defendant has a choice of more than one method of performance, damages are generally assessed by reference to the method which is least unfavourable to him - see Paula Lee v. Robert Zehil [1983] 2 All ER 390.

Two further explanations are provided which relate to the tortious/tortious and contractual breach. For all practical purposes these two further explanations have the same effect<sup>141</sup>.

From the general principles the following principle can reasonably be inferred:

*'the purpose of the grant of an extension of time is to seek to put the contractor in the position it would have been in had the delaying event not occurred'.*

Any such general rule is of course subject to any express provisions of the contract.

The inferred rule would indicate a need to:

- have a resolved view of what would have happened had the delaying event not occurred; and
- properly take account of alternative causes.

The requirement for a resolved view would be best met by the use of the retrospective approach. Completion of an As-Built programme will provide the opportunity of bringing all potential causes of delay into the equation. The need to take account of all alternative causes should be reflected in the approach adopted to concurrency.

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<sup>141</sup> Damages are awarded to put the plaintiff as nearly as possible *'in the same position as he would have been in had he not sustained the wrong for which he is now getting compensation or reparation'* (Lord Blackburn in *Livingstone v. Raywards Coal Company* (1880) App. Cas. 25 at 39 (H.L.)).

*'The governing purpose of damages is to put the party whose rights have been violated in the same position, so far as money can do, as if his rights had been observed'* (Asquith L.J in *Victoria Laundry Ltd v. Newman Ltd* [1949] 2 K.B. 528 at 539 (C.A.))



### **2.3.8. Concurrency**

The purpose of analysing the time requirements of a project is, primarily, twofold:

- to establish an entitlement to an extension of time to obtain relief from liquidated damages;
- for the contractor to establish an entitlement to delay related loss and/or expense;

There is a third aspect which is important for the Employer's point of view and that is to establish which third parties, if any, were responsible or share responsibility for delay. This third aspect will only apply to some projects and therefore should not dictate the choice of approach.

The approach to concurrency in respect of the extension of time required to obtain relief from liquidated damages may be different to the approach required to establish an entitlement to delay related loss and/or expense.

Therefore the delay analysis may be required to produce alternative answers, one for relief from liquidated damages and a second for compensation to the contractor. The commentators appear to agree on this. The contemporaneous approach cannot accommodate this without a complete reworking of the analysis on the alternative basis.

There has been, in recent times, a wide debate in respect of the matter of the resolution of concurrent causes of delay. It is, without a complete recapitulation of the material reviewed as part of this research, possible to say that:

- there are no clear legal precedents available in respect of the definition of concurrency or its treatment;

- there is no consensus between commentators in respect of the definition of concurrency;
- there is no consensus between commentators in respect of how concurrent causes should be treated.

Many commentators seek to find a solution to issues of concurrency in contractual claims by reference to the way in which concurrency can be resolved in tortious claims. In tort it is likely that the issues to be resolved are simple. They are simple in the sense that, almost invariably, they relate to a single event of damage and it is the causes which are, potentially, complex. Thus the most dramatic examples are illustrated by cases of serious incapacity or death. The serious incapacity or death (the damage) may be, potentially, due to a number of causes (breaches) but the damage is generally in the singular. For that reason any attempt to draw a parallel with those tortious solutions is likely to fail in anything other than a single delay situation.

The basic principles relating to concurrency offered in Keating<sup>142</sup> appear clearer than the explanations offered by many. Although the debate is not repeated here the conclusion is that *'consistency and common sense suggest adopting the dominant cause approach'*<sup>143</sup>.

It is contended that a method of analysis which incorporates a practical and common sense approach to the resolution of concurrency is required. It is further contended that any approach which seeks to review, match and analyse individual delaying events in isolation is doomed to failure through complexity. An approach which takes a broad, project wide, view of concurrency and which can bring a proper balance to the notions

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<sup>142</sup> May Anthony J, (1995) QC, Supra Pages 207 to 214.

<sup>143</sup> May Anthony J, (1995) QC, Supra Page 213, although a recent case has suggested that the dominant cause approach is not correct.

of fairness, weight and/or dominance and common sense is one which will, ultimately, prevail.

It is suggested that, for all practical purposes, this can be translated to mean that where there are a number delays caused by each party and those delays are of approximately equal efficacy<sup>144</sup> the overall effect of the aggregate of those delays may be 'netted off'.

It is important, in considering the overall impact of delays, that the analyst take a view as to which delays are real and effective as opposed to those which are simply progress related events or immaterial matters which can be discounted as effective causes of delay. Only experience can assist the analyst in making this choice.

Discounting for concurrency can be achieved by an overall adjustment based on the total amount of delay caused by each party.

It is considered that by identifying and selecting only the 'real and effective' delays and then 'netting off' in this way is justified because it is not practical to consider and test each delay in isolation. In practice a construction project will be subject to a number of different delays (instances of damage) which may each relate to a number of causes (breaches) which, taken together, contribute to an overall delay to project completion.

It follows, therefore, that any approach to delay analysis which takes a fixed view of concurrency ought to be avoided.

Review of recent UK publications and of the concepts of causation and concurrency confirm the view that:

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<sup>144</sup> Taken here to mean force, power, validity or weight rather than size.



- the retrospective approach to delay analysis is the most appropriate for use in the UK;
- if adequate information is available the contemporaneous approach can be used during project performance;
- in certain circumstances the prospective approach may be used.

## 2.4. UK Case Law

There is little or no UK case law relating directly to the techniques and methodology which would provide adequate proof of a delay claim. UK case law related to delay claims is limited:

### 2.4.1. **Wells v Army & Navy Co-operative Society<sup>145</sup>**

The judge was faced with the argument that the owner had caused delay but counsel for the owner said that as the contractor had also caused delay he was not entitled to relief from penalties. There were two answers the judge said, one in fact and the other in law.

*“The answer in fact is, that there may have been some delay on the part of the builder, and I am including in the consideration of this assumption that he was responsible under the contract for the delay in the delivery of the ironwork by (a sub contractor) - even assuming that it was in fact the delay of the builder or any delay by those for whom he was responsible which prevented the execution of this work within the contract time, in my judgment, whatever the builder might have done, the delay of the building owners and of their architect was such as to render the performance of the work within the contract time impossible.”*

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<sup>145</sup> Wells v Army & Navy Co-operative Society (CA 1903) Construction Law Year Book, Vol 4 page 65.

*"In law I wholly deny the proposition (counsel) put forward, which was this really.*

*'Never mind how much delay there may be caused by the conduct of the building owner the builder will not be relieved from penalties When he too has been guilty of delay in the execution of the works.'*

*I do not accept that proposition in law."*

This case is referred to in the Australian case of **Commissioners of the State Bank of Victoria v. Costain Australia Limited**<sup>146</sup>.

#### **2.4.2. Amalgamated Building Contractors v Waltham Holy Cross UDC**<sup>147</sup>

This case is subsequently cited in **Balfour Beatty Building Ltd v Chestermount Properties Ltd**<sup>148</sup>.

Denning LJ also dealt with the matter of an excusable delay which occurred in a period of culpable delay, he observed (at 454):

*'... the contractors say that the words in cl 18 "The architect shall make a fair and reasonable extension of time for completion of the Works" mean that the architect must give the contractors a date at which they can aim in the future, but he cannot give a date which has passed. I do not agree with this contention. It is only necessary to take a few practical*

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<sup>146</sup> **Commissioners of the State Bank of Victoria v. Costain Australia Limited** ((1983) 2ACLR 1 at 5 per Gobbo J). *'In particular I have considerable reservations as to the arguments that postulated that the Architect was bound to give effect to the possibility of the Builder taking steps to minimise any delay. Though the Builder may be under a general duty to minimise the effects of any delays, he is not in my opinion obliged to recast his operations significantly and thus accommodate extra work and obviate the need for an extension of time ... Where the Builder has, by careful management, husbanded some saving in time, the Builder should not be deprived of the benefit of such changes. Where an Architect, with the benefit of knowledge of all the actual circumstances, makes a fair and reasonable extension, it seems unlikely that he would be able, in effect, to deprive the Builder of the benefit of this saving by allocating it only to the extra work'*

<sup>147</sup> **Amalgamated Building Contractors v Waltham Holy Cross UDC** [1952] 2 All ER 452.

<sup>148</sup> **Balfour Beatty Building Ltd v. Chestermount Properties Ltd.** (QBD 1993) 62 BLR 1.

*illustrations to see that the architect, as a matter of business, must be able to give an extension even though it is retrospective. Take a simple case where the contractors, near the end of the work, have overrun the contract time for six months without legitimate excuse. They cannot get an extension for that period. Now suppose that the works are still uncompleted and a strike occurs and lasts a month. The contractors get an extension of time for that month. The architect can clearly issue a certificate which will operate retrospectively. He extends the time for one month from the original completion date, and, the extended time would obviously be a date which has 'already passed. Or take a cause of delay, such as we have in this case, due to labour and materials not being available. That may cause a continuous delay operating partially, but not wholly, every day, until' the works are completed. The works do not stop they go on, but they go on more slowly right to the end of the works. In such a case, seeing that the cause of delay operates until the last moment, when the works are completed, it must follow that the architect can give a certificate after they are completed. These practical illustrations show that the parties must have intended that the architect should be able to give a certificate which is retrospective, even after the works are completed.'* (My emphasis.)

#### **2.4.3. J Crosby & Sons Ltd v. Portland Urban District Council.<sup>149</sup>**

This case considers questions in the form of a special case in an arbitrator's award. The arbitrator's award and the subsequent consideration by the Court is often cited as authority for the use of 'global' claims and in support of the notion that detailed analysis is unnecessary. That conclusion if it is valid at all is limited to those cases which meet several conditions.

The arbitrator had made a finding of fact that a delay of 31 weeks was caused by matters for which the respondents were solely liable. This

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<sup>149</sup> J Crosby & Sons Ltd v. Portland Urban District Council. (QBD 1967) 5 BLR.



finding was not reviewed as part of the special case. In respect of the delay claim the arbitrator had awarded a sum to the claimant. The question posed for the Court was whether upon the facts found, the claimant was entitled to any payment at all, as the arbitrator had not been able to allocate the monetary award to the various matters set out in the Points of Claim.

The passage of the arbitrator's award which discloses the nature of his approach was as follows:

*'The result in terms of delay and disorganisation of each of the matters referred to above was a continuing one. As each matter occurred its consequences were added to the cumulative consequences of the matters which had preceded it. The delay and disorganisation which ultimately resulted was cumulative and attributable to the combined effect of all these matters. It is therefore impracticable if not impossible to assess the additional expense caused by delay and disorganisation to any one of these matters in isolation from the other matters.'*

A subsequent report in respect of Merton<sup>150</sup> continues this passage as follows:

*'The question was whether on those facts the claimants [the contractors] was entitled to any payment under the head of general claim for delay and disorganisation. That is, whether they were entitled to roll up several heads of claim into a claim for a global sum or whether they were entitled only to aggregate separate awards for separate items separately established.'*

In upholding the arbitrators award and dismissing the alternative award in

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<sup>150</sup> London Borough of Merton v. Stanley Hugh Leach Ltd. (CD 1985) 32 BLR 51 as set out more fully below.

respect of the fifth dispute Donalson J accepted that where:

*'the extent of the extra cost incurred depends on an extremely complex interaction between the consequences of various denials, suspensions and variations, it may well be difficult or even impossible to make an accurate apportionment of the total extra cost between several causative events'.* In so doing he gave judicial approval to what is described by the commentators as *'a widespread and common sense approach to measuring claims'* ie *'global'* claims.

The commentators restate and develop the principles to be applied as follows:

*'The events which are the subject of the claim must be complex and interact so that it is difficult if not impossible to make an accurate apportionment. It is very tempting to take the easy course and to lump all the delaying events together in order to justify the total over run or total financial shortfall. That argument is justifiable only if the alternative course is shown to be impractical.'*

*'There must be no duplication. This point is self evident.'*

*'Any financial claim must exclude profit, if profit is irrecoverable under one or more of the heads underlying the claim. Since the profit element in claims is not always a significant part disqualification may not be a great hardship. It does however, require claims for variations based upon rates, to be seen to be shorn of a profit element if the claims are mixed up with or indistinguishable from other claims for which only 'cost' or 'expense' are recoverable.'*

The arbitrators approach to calculating the 31 weeks delay awarded is neither explained or commented upon by the judge.

**2.4.4. Henry Boot Construction Ltd v. Central Lancashire New Town Development Corporation.<sup>151</sup>**

The work fell within the description of '*work being done by ... others engaged by the employer*' when the statutory undertaker was carrying out work for the employer which it was not obliged to do by statute. This decision clarifies the status of statutory undertakers vis-a-vis the extension of time provisions of the contract. Whilst of general interest in the resolution of time claims it is of no direct relevance to impact analysis.

**2.4.5. Walter Lawrence & Son Ltd v Commercial Union Properties (UK) Ltd<sup>152</sup>**

A Contractor under a JCT 63 contract fell behind with his programme. The Architect refused to grant an extension of time for adverse weather conditions on the grounds that had the Contractor followed the programme he would not have been affected by the weather conditions. Rejecting this argument, the Court held that the Contractor was entitled to an extension of time.

**2.4.6. Martin Grant & Co Ltd v. Sir Lindsay Parkinson Co Ltd.<sup>153</sup>**

The plaintiff, a sub contractor, was required by the sub contract to '*... proceed with the ... works ... at such time or times as the contractor shall require ...*'. The plaintiff pleaded that there should be an implied term in the sub-contract that the defendants would make sufficient work available

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<sup>151</sup> Henry Boot Construction Ltd v. Central Lancashire New Town Development Corporation (QBD 1980) 15 BLR 1.

<sup>152</sup> Walter Lawrence & Son Ltd v Commercial Union Properties (UK) Ltd. (1984) 4 ConLR 37.

<sup>153</sup> Martin Grant & Co Ltd v. Sir Lindsay Parkinson & Co Ltd. (CA 1984) 29 BLR 31.



to enable them to maintain reasonable progress. Having regard to the express terms the Court of Appeal held that there was no room for the implied term.

The practical effect was that there was no fixed contract period and that the sub-contractor was bound to provide resources as and when required by the main contractor. This effectively prevented the sub-contractor from being able to make any time related claims.

Such contracts are often referred to as 'beck and call' contracts.

#### **2.4.7. Yorkshire Water Authority v. Sir Alfred McAlpine & Son (Northern) Ltd.<sup>154</sup>**

The defendant submitted a bar chart and a method statement with its tender. The plaintiff approved the method statement and the minutes recording that agreement were incorporated in the formal agreement between the parties. In the event it was impossible to follow the method statement and the defendant altered the flow of work.

In a judicial review of an arbitrators interim award it was held that the incorporation of the method statement imposed upon the contractor an obligation to follow it. The method statement therefore became a specified method and the change to the sequence of work due to impossibility within clause 13(1) of the ICE conditions gave rise to a variation under clause 51 and payment under clauses 51(2) and 52.

This decision illustrates the reluctance of the courts to incorporate any form of programme into a contract and that this will only be done where the intention to incorporate is clear and unambiguous.

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<sup>154</sup> Yorkshire Water Authority v. Sir Alfred McAlpine & Son (Northern) Ltd. (QBD 1985) 32 BLR 114.

#### 2.4.8. London Borough of Merton v. Stanley Hugh Leach Ltd.<sup>155</sup>

This decision concerns an appeal against an arbitrators award on 15 issues. The issues of particular relevance to delay claims are Issue 1 implied terms, Issue 5 questions related to giving notice of delays and Issue 9 *'rolled up'* claims.

In respect of Issue 1 it was held that there were implied terms:

- that the employer would not hinder or prevent the contractor from carrying out its obligations in accordance with the terms of the contract and from executing the work in a regular and orderly manner;
- that the architect would provide correct information;
- that the architect would administer the contract in an efficient and proper manner.

The Judge was reluctant to go further and imply a higher degree of co-operation.

It was held in respect of Issue 5 that the contractors programme, provided at the beginning of the project, was a specific application for instructions, drawings, details or levels as required by the contract and was therefore good notice. It is necessary however to consider each item of information applied for by that means on its merits. The Judge considered the question of whether the application *'was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for [Leach] to receive the same'*. It was decided that the date referred to was the date upon which the information was required and not the date of the request. Any such request may, however, have to be revised to allow for any delays and other changes which might occur in fact. Use of a

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<sup>155</sup> London Borough of Merton v. Stanley Hugh Leach Ltd. (CD 1985) 32 BLR 51.

programme for the purpose of providing notice is well established in US law<sup>156</sup>.

So far as '*rolled up*' claims are concerned it was apparently agreed before the arbitrator that he must follow Crosby.<sup>157</sup> Counsel for Merton submitted that six conditions must be satisfied before Leach could recover under clause 11(6) or 24(1) a rolled up sum. The six conditions are not listed and these were not considered as part of the appeal. All six conditions were apparently satisfied by Crosby. The judge was invited to overturn Crosby and declined.

Vinelott J adds a further principle to those identified in Crosby; that the contractor has not unreasonably delayed in making the claim and so has himself created the difficulty.

Taking Crosby and Merton together it is difficult to see that the approval of rolled up claims extends to anything other than the financial evaluation of the consequences of delay (and disruption). This view is supported by Brown<sup>158</sup>. Commenting on the judgment of Vinelott J, Brown says '*It cannot be relied upon as authority for not performing the analysis showing cause and effect*'.

See also the reference to the conditions which have to be satisfied before an award can be made which apparently had been satisfied in respect of each head of claim.

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<sup>156</sup> Fullerton Construction Co., (ASBCA 12275, 69-2 BCA ¶ 7876 (1969)). A CPM (plus other contemporaneous evidence) was accepted as notice of the need to approve certain drawings within 7 days of their issue. An owner may be responsible for the time allotted in a CPM schedule for owner approvals when the owner approves the schedule.

<sup>157</sup> J Crosby & Sons Ltd v. Portland Urban District Council. (QBD 1967) 5 BLR.

<sup>158</sup> Brown Jeffrey C, (1995) Prolongation and Disruption - problems of causation for the construction industry. CIOB Construction Papers No 56.



**2.4.9. Greater London Council v. The Cleveland Bridge and Engineering Co Ltd and Another.<sup>159</sup>**

The defendant was acting as contractor, as part of a consortium, for the supply of gates and/or gate arms for the Thames Barrier project. The GLC sought to establish that the contractor was in breach by delaying the manufacture of the gates and/or gate arms. The GLC were unhappy that Cleveland had delayed completion of the components thereby exposing the GLC to a significant increase in costs under the inflation formula as the formula provisions were tied to the completion date of manufacture. The arguments were complex but so far as time for performance was concerned the Court of Appeal upheld the Arbitrators finding. In dismissing the appeal the Court of Appeal held:

*'Cleveland's principal and express obligation was to comply with the key (completion) dates. No such express terms as contended for by the GLC could be spelled out of the contract conditions.'*

*'The term as to due diligence did not fall to be implied into the agreement; no such term was necessary to give business efficacy to the contract...'*

*'Because there was no obligation to do more than comply with the key (completion) dates Cleveland were not ... (negligent in the terms of clause 51) ... if they chose to conduct their programme in a manner which suited them.'*

The facts of this case are rather peculiar and may not find a direct parallel in many projects.

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<sup>159</sup> Greater London Council v. The Cleveland Bridge and Engineering Co Ltd and Another (CA 1986) 34 BLR 50.

#### 2.4.10. Glenlion Construction Ltd v. The Guinness Trust.<sup>160</sup>

The plaintiff, a contractor, produced a programme which showed completion earlier than the date for completion in the contract. It was held that the contractor was entitled to finish early but there was no obligation on the employer to *'so perform the said agreement as to enable the contractor to carry out the works in accordance with the programme'*.

It appears that the law in the US has developed beyond this point<sup>161</sup>.

#### 2.4.11. H Fairweather & Co Ltd v. London Borough of Wandsworth.<sup>162</sup>

This case deals with two aspects of extensions of time. The first point is whether the grant of an extension of time is, under the JCT Forms, a condition precedent to the award of direct loss and expense. HH Judge Fox-Andrews QC held that it was not.

Having decided that an extension of time was not a condition precedent to the award of direct loss and expense it should not matter what reasons are given for the extension of time. In any event the standard JCT forms provide that an extension of time shall be given on the occurrence of specified events. It is arguable that without particular language the concept of concurrency, so far as it relates to contractor default, is not relevant to determining the extension. On that basis it is right that the analyst should always look behind any extension granted for the purposes

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<sup>160</sup> Glenlion Construction Ltd v. The Guinness Trust. (QBD 1987) 39 BLR 89.

<sup>161</sup> Green Builders, Inc., (ASBCA No. 35518. 88-2 BCA ¶ 20,734 (1988)). The contract required completion within one year. The contractor, developing the CPM schedule, anticipated completion within seven months and based its bid on the early completion schedule. Redesign delayed completion until three months after the contractors projected completion date - two months before the contractual completion date. The contracting officer denied the claim because the project was completed before the contract completion date. The Board found the contractor had a right to recover delay costs based on the scheduled early completion date since the contractor showed its performance plan was reasonable. See also Montgomery-Ross-Fisher, (Appeal) (PSBCA Nos. 1033, 1096, 84-2 BCA (CCH) ¶ 17,492 (1984)). The fact that a contractor completed the project within the contract period did not invalidate its delay claim.

<sup>162</sup> H Fairweather & Co Ltd v. London Borough of Wandsworth. (QBD 1987) 39 BLR 106.



of relieving the contractor of liquidated damages to determine whether any time should be discounted in the financial evaluation due to concurrent contractor defaults.

The second point was whether, where there were competing causes of delay, the cause of the delay should be ascribed to the dominant cause. The Judge held that the dominant test was not the correct one. The decision is rather unhelpful in that it does not suggest what might be the correct test. In the event the judge was not entirely sure what the arbitrator had done and he remitted the award to him. Taken with the finding on the matter of the extension of time it appears that the judge may have had it in mind that there should be some form of apportionment between the competing causes.

**2.4.12. Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical.<sup>163</sup>**

HH Judge John Newy QC declined to construe the contract in a way so as to incorporate a programme. The decision is principally concerned with the construction of the contract and the question of whether the contract, which was signed towards the end of the period of performance, was retrospective in its effect. The judge found that the contract once signed was retrospective in effect. On the matter of construction the judge would not rely on pre contract discussions when considering whether the programme was a contract document. In this context of course pre contract means prior to the signing of the contract which was after a large proportion of the work was finished. It seems perverse that part of the reasoning of the judge for not incorporating the programme was that by the time the contract was signed it was impossible for it to be worked to and it was obvious that there would be numerous trades working together and be disruption.

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<sup>163</sup> Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical. (1989) 6-CLD-02-07 (Q.B. 1989).



#### 2.4.13. Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2).<sup>164</sup>

The decision here was that an extremely large claim in connection with delay to a construction project in Hong Kong was dismissed because of an abuse of process. The claim was not dismissed because of insufficient particularisation of the claims. See below in respect of **Imperial Chemical Industries PLC v. Bovis Construction Ltd and Others**<sup>165</sup> where this decision is put into context. The commentators however have this to say about the impact of the decision so far as delay claims are concerned:

*'It must therefore follow from the decision of the Privy Council in Wharf Properties -v- Eric Cumine Associates that Crosby and Merton are to be confined to matters of quantum and then only where it is impossible and impracticable to trace the loss back to the event. The two cases are not authority for the proposition that a claimant can avoid providing a proper factual description of the consequences of the various events upon which reliance is placed before attempting to quantify what those consequences were to him. Thus, taking the example before the Privy Council, it seems that it will in future be necessary for a plaintiff to be quite specific as to the delay which it is alleged was caused by an event such as a breach of contract or an instruction giving rise to a variation. This in turn will mean that those responsible for the preparation and presentation of claims of this kind will need to work hard with those who have first-hand knowledge of the events so as to provide an adequate description of them. Equally, it will mean that proper records will need to be kept or good use will have to*

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<sup>164</sup> Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2). (JCPC 1991) 52 BLR 1.

<sup>165</sup> Imperial Chemical Industries PLC v. Bovis Construction Ltd and Others. (QBD 1992) 32 ConLR 90.

*be made of existing records to provide the necessary detail. It will no longer be possible to call in an outsider who will simply list all the possible causes of complaint and then by use of a series of chosen "weasel" words try to avoid having to give details of the consequences of those events before proceeding to show how great the hole was in the pocket of the claimant. There must be, as the Privy Council points out an "agenda" for the trial: there must be a discernible connection between the wrong and, where delays are relied on, the consequent delay.'*

**2.4.14. McAlpine Humberoak Ltd v. McDermott International Inc (No 1).<sup>166</sup>**

This case is of particular interest for its commentary on the approach to the delay claim. The plaintiffs delay analysis is described as a bar chart. The judge at first instance dismissed the defendants' approach as being '*a retrospective<sup>167</sup> and dissectional reconstruction by expert evidence of events almost day by day, drawing by drawing, TQ by TQ and weld procedure by weld procedure, designed to show that the spate of additional drawings which descended on McAlpine virtually from the start of the work really had little retarding effect on its progress*'. The Court of Appeal by contrast expressed the view that '*the defendants approach is just what this case required*'. It is of course possible that the Court of Appeal went too far in the opposite direction. In any event, given the limited amount of evidence which they themselves heard, the appeal judges appear to have relied upon impression rather than on a detailed appreciation of the analysis.

This case also confirms that the net rather than gross method of measuring delay is the correct approach. As to which see further below in **Balfour Beatty v Chestermount**.

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<sup>166</sup> McAlpine Humberoak Ltd v. McDermott International Inc (No 1) (CA 1992) 24 ConLR 68.

<sup>167</sup> It is likely that the judge is referring to an analysis carried out after the event rather than one which adopted retrospective or hindsight pricing of the delay.



#### 2.4.15. Imperial Chemical Industries PLC v. Bovis Construction Ltd and Others.<sup>168</sup>

Disputes arose between ICI and the defendants and on 3rd October 1989 ICI issued and served their writ and statement of claim against Bovis, GMW and Faber. Bovis was the contractor, GMW were the architects and Faber were the engineers. The claim was in respect of delay and additional costs. In the original pleading no attempt was made to link any particular breach by any particular defendant to any loss. In effect a global claim was made against each of the three defendants. Soon after service of the writ GMW requested extensive further and better particulars some of which were specifically required to be in the form of a schedule. Particulars were not provided and in May 1990 GMW made an application for an order. ICI accepted that the claim for delay was inadequately pleaded and were ordered to provide their best particulars by July 1990. The defendants were ordered to serve their defences by October 1990. On 31st July 1990 in purported pursuance of the order ICI served an amended statement of claim containing seven schedules. On 26th October GMW served a request, this repeated their original requests, contained further requests and again asked for a Scott schedule. The defences were served in October, November and December 1990. There was a further application before the Judge on 10th November 1990 where each defendant objected strongly to the lack of particularity in the amended claim. ICI again conceded that their claim was inadequately pleaded in material respects. The Judge ordered that a Scott schedule be served by 14th February 1991. That schedule was required to contain the following information:

- the alleged complaint;
- the defendant against whom the complaint was made;

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<sup>168</sup> Imperial Chemical Industries PLC v. Bovis Construction Ltd and Others. (QBD 1992) 32 ConLR 90.



- which clause of which agreement had been breached;
- the alleged factual consequences of any breach.

On 14th February 1991 ICI served their Scott schedule, or their purported Scott schedule. The Scott schedule ran to ninety-two pages but was inadequate in significant respects. In particular it failed to specify the financial consequences of each breach. ICI contended that they required full discovery and inspection in order to plead properly. The Judge ordered that there should be inspection of all parties documents after 31st May 1991 and that ICI should serve a Scott schedule in proper form by 15th November 1991. In October ICI applied for an extension of time to serve the schedule to 20th December 1991. The defendants sought an unless order for the original date and in the event ICI were ordered to serve the schedule by 2nd December 1991. ICI served their purported Scott schedule on 2nd December. There followed a delay of about one year and in January 1993 there were applications from all three defendants seeking that the claim be struck out on all grounds.

In dealing with this application the Judge considered the Privy Council decision in **Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2)**.<sup>169</sup> which expressed no reservations about the correctness of the decision in **J Crosby & Sons Ltd v. Portland Urban District Council**.<sup>170</sup> or **London Borough of Merton v. Stanley Hugh Leach Ltd**.<sup>171</sup> Fox-Andrews J apparently approved Crosby and Merton and took an extract from Wharf dealing with those cases and putting the matter in perspective. Fox-Andrews quotes the judgment of Lord Oliver of Aylmerton at page 20. The important part of that quote appears to be dealing with the distinction between what Crosby and

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<sup>169</sup> **Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2)**. (JCPC 1991) 52 BLR 1.

<sup>170</sup> **J Crosby & Sons Ltd v. Portland Urban District Council**. (QBD 1967) 5 BLR 121.

<sup>171</sup> **London Borough of Merton v. Stanley Hugh Leach Ltd**. (CA 1985) 32 BLR 51.

**Merton** say regarding the quantification of the consequences of delay and establishing the factual consequences of the alleged breaches:

*'Those cases establish no more than this, that in cases where the full extent of extra cost incurred through delay depend upon a complex interaction between the consequence of various events, so that it may be difficult to make an accurate apportionment of the total extra costs, it may be proper for an arbitrator to make individual financial awards in respect of claims which can conveniently be dealt with in isolation and a supplementary award in respect of the financial consequences of the remainder as a composite whole. This has, however no bearing upon the obligations of a plaintiff to plead his case with such particularity as is sufficient to alert the opposite party to the case which is going to be made against him at the trial. ECA are concerned at this stage not so much with the quantification of the financial consequences - the point with which the two cases referred to (Crosby and Merton) were concerned - but with the specification of the factual consequences of the breaches pleaded in terms of period of delay.'*

The judgment at page 11 then considers the Scott schedule. Fox-Andrews describes a schedule as an admirable tool for dealing with factual issues.

*'By use of a schedule the pleadings proper will be limited to dealing with the legal issues, they will deal with the terms of the contract express or implied, those terms which were allegedly breached and in summary form in what respects they were breached'.*

The judgment contains much detailed commentary about the content of the Scott schedule and the defendants complaints about particularisation. The important points of criticism as related to delay claims, and ignoring



simple complaints about poor cross referencing and general inconsistencies, include:

- The schedule was inconsistent with the statement of claim. In particular the relevant clauses of the agreements stated to have been breached were frequently not pleaded in the statement of claim.
- So far as the delay claim against GMW was concerned a number of points can be distilled:
  - A claim that information was provided to Bovis late was particularised thus *'Failure to ensure that the First Defendants were in possession of the drawings and information to enable realistic competitive tenders to be invited.'* This the judge said was inadequate particularisation.
  - Taking as an example an allegation relating to problems with kitchen hoods the factual consequences were described thus *'Delay to the progress of the mechanical installation the kitchens and subsequent traders.'* This appeared to be adequate. The number of weeks of delay were set out and this appears to have been adequate. The judge indicated that failure to identify *'the dates between which the delay occurred and whether such delay was continuous or intermittent'* or *'to link a particular inadequacy (breach) to a particular trade'* or *'to show in any way why the inadequacy (breach) is alleged to have caused or contributed to the delay'* was unacceptable.
  - For the delay claim against Faber there are similar complaints. *'There is no linkage alleged between a particular inadequacy (breach) and a particular delay by a statement of claim'*.



- An allegation that drawings continued to be revised was criticised in that there was no indication whether the revisions were major or minor.
- Another allegation that a delay was caused by delay to information or late transfer of information required particulars in respect of *'as to when the information ought to have been given or when it was given or the nature of the work which was delayed or why it was delayed'*.

These points can be used as a basis to construct a picture of what the judge would have found adequate in terms of particularisation. It is contended that even if by current standards such information was denied as further particularisation it would nevertheless represent the minimum level of proof required at trial. See below in respect of *Lloyds v Kitsons*<sup>172</sup> where the list of requirements has been identified.

#### 2.4.16. **Pigott Foundations Ltd v. Shepherd Construction Ltd.**<sup>173</sup>

The Plaintiff was piling sub-contractor and the Defendant main contractor. There were delays in installing the piles and disputes arose over whether Pigott was required to comply with the main contractors programme and whether there was an effective limit on the level and extent of damages due to delay.

The decision in this case did a number of things:

- applied the decision in **Greater London Council v. The Cleveland Bridge and Engineering Co Ltd and Another** to the DOM/1 conditions;

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<sup>172</sup> *The Society of Lloyds v. Kitsons Environmental Services and Others*. (QBD 1994) Unreported.

<sup>173</sup> *Pigott Foundations Ltd v. Shepherd Construction Ltd*. (QBD 1993) 67 BLR 48.

- found that clause 11 of DOM/1 did not require the subcontractor to work to the main contract programme;
- made findings which effectively limited the amount of damages that the contractor could claim in respect of delay and disruption.

These findings may be restricted to the particular facts of this case and in any event leave was given for appeal and the matter was settled before that appeal could be heard.

#### 2.4.17. **Balfour Beatty Building Ltd v. Chestermount Properties Ltd.**<sup>174</sup>

This case involves an appeal by the contractor against an arbitrators award. The contract involved the construction of the shell and core of an office block. The contractor failed to complete within the extended time for completion and was in a period of culpable delay when an instruction was issued introducing the fitting out work. There was a dispute about the way in which the impact of the introduction of the fitting out work should be measured. The contractor argued that it was entitled to an extension of time calculated by adding a reasonable time for completing the additional work to the date of issue of the instruction. The employer argued that the net effect of the additional work should be added to the previously extended completion date. These matters were distilled into two questions by the arbitrator:

- Question 1:

*'Does Clause 25 confer upon the Architect jurisdiction to grant an extension of time for the completion of the Works in respect of a Relevant Event occurring during a period of culpable delay?'*

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<sup>174</sup> Balfour Beatty Building Ltd v. Chestermount Properties Ltd. (QBD 1993) 62 BLR 1. See also an informative article by Reg Thomas and Ian Dunbar CLJ (1) 1995 page 7.

The arbitrator answered that clause 25 did confer such jurisdiction on the architect.

- Question 2:

*'In granting an extension of time in respect of the Relevant Event occurring during a period of culpable delay, ought the Architect to award a 'gross' extension (that is, one that re-fixes the Completion Date at the calendar date upon which the work would reasonable be expected to be completed having regard to the calendar date upon which it is instructed) or ought it to be a 'net' extension (that is, one which calculates the revised Completion Date by taking the date currently fixed and adding the number of days which the Architect regards as fair and reasonable)?'*

The arbitrator answered that question as follows:

*'In granting an extension of time in respect of a Relevant Event occurring during a period of culpable delay, the Architect ought to have awarded a 'net' extension of time, that is, one which calculates the Completion Date by taking the date currently fixed and adding the number of days which the Architect regards as fair and reasonable.'*

In dismissing the appeal Colman J dealt with the two questions as follows:

- Question 1:

*'The architect's power to grant an extension pursuant To clause 25.3.1.1 could operate only in respect of*



*relevant events which occurred before the original or the previously fixed completion date, whichever was the later, but the power to grant an extension of time pursuant to clause 25.3.3 applied to any relevant events. The natural meaning of this sub-clause was wide enough to include relevant events which occurred after as well as before any previously fixed completion date.'*

*'The remarkable consequences of the application of the principle [that an act of prevention would disentitle the employer to liquidated damages] could therefore be that if, as in the present case, the contractor fell well behind the clock and overshot the completion date and was unlikely to achieve practical completion until far into the future, if the architect then gave an instruction for the most trivial variation, representing perhaps only a day's extra work, the employer would thereby lose all right to liquidated damages for the entire period of culpable delay up to practical completion or, at best, on the respondents' submission, the employer's right to liquidated damages would be confined to the period up to the act of prevention. For the rest of the delay he would have to establish unliquidated damages. What might be a trivial variation instruction would on this argument destroy the whole liquidated damages regime for all subsequent purposes.*

*So extreme a consequence for the future operation of the contract could hardly reflect the common intention, particularly having regard to the very specific distribution of risk provisions which are agreed to be applicable in respect of relevant events occurring*

*before the completion date. It is certainly a construction which is most improbable in the absence of some other express provision supporting it.'*

- Question. 2:

*'The purpose of the architect's power under clause 25.3 was to fix the period of time by which the period of time available for completion ought to be extended or reduced having regard to the incidence of the relevant events measured by the standard of what is fair and reasonable. This exercise treated as co-extensive (i) the period of postponement of the completion date and (ii) the period of delay caused by the relevant event. The completion date as adjusted was not a date by which the contractor ought to have achieved practical completion but the end of the total number of working days starting from the date of possession within which the contractor ought fairly and reasonable to have completed the works. The 'net' method of extension gave effect to this whereas the 'gross' method did not.'*

In this decision the dicta of Denning LJ in **Amalgamated Building Contractors v Waltham Holy Cross UDC**<sup>175</sup> was explained and followed.

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<sup>175</sup> **Amalgamated Building Contractors v Waltham Holy Cross UDC** [1952] 2 All ER 452.

It seems that the law in the US had adopted the net method of extension well before the UK<sup>176</sup>.

**2.4.18. West Faulkner Associates v. London Borough of Newham.<sup>177</sup>**

This appeal was concerned with two questions. First the proper construction of clause 25 (1) (b) of the JCT Standard Form Local Authorities 1963 Edition (June 1977 Revision). Since the wording of that clause is common to many standard form contracts, the Court of Appeal decision is of general importance. The second question was whether the Architect was wrong to insist that his approach was that of a reasonably competent architect exercising reasonable skill and care.

The Architect had failed to issue a notice under clause 25 (1) (b) even though the contractor was apparently not proceeding diligently. The Architect contended that the contractor had to be failing on both counts ie to proceed regularly or diligently before such a notice could be issued. The Court of first instance rejected this interpretation as did the Court of Appeal. The second point of appeal was the Architects contention that such an interpretation was reasonable and that therefore he was not negligent in maintaining his interpretation. The Court of Appeal found no merit in this argument.

The commentators say that *“‘Regularly’ is the requirement to attend on site with sufficient resources by way of men and materials, to have the ‘physical capacity’ to progress the works in accordance with the*

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<sup>176</sup> Electronic & Missile Facilities, Inc., (GSBCA No. 2787. 71-1 BCA 8785 at 40,809-810 (1971)). The court said *‘It is our view that where a change is ordered the extension of time for completion is measured by the amount of delay attributable to the change, whether the change is ordered before or after the original contract completion date’*. See also Robert P Jones Co (AGBCA No. 391, 76-1 BCA ¶ 11,824 (1976)) ... *‘contractor entitled to time extension for delay resulting from excusable causes even where progress was partly delayed by the contractors own inexcusable delay’*. And Santa Fe Inc. (VABCA Nos. 1943 et al., 84-2 BCA ¶ 17,34 (1984)). The Board states: *‘... a close examination of ... cases cited by Appellant reveals that the important issue is not when the change order was issued, but the impact that change had on the completion of the project’*.

<sup>177</sup> West Faulkner Associates v. London Borough of Newham [1994] 71 BLR 1.



*contractual requirements. "Diligently" related to the application of that physical capacity towards the same end.' So far as the meaning of clause 25 (1) (b) is concerned the conclusion of Simon Brown LJ was: 'Taken together, the obligation upon the contractor is essentially to proceed continuously, industriously and efficiently with appropriate physical resources so as to progress the works steadily towards completion substantially in accordance with the contractual requirements as to time, sequence and quality of work.'*

The Court of Appeal upheld the decision of first instance in finding that, on the particular facts of this case, the contractor was not proceeding diligently and that the Architect was in breach of their duty by failing to give the contractor notice under clause 25 (1) (b). Of particular relevance to this analysis are the various comments relating to the extent of poor performance which may constitute a failure to proceed regularly and diligently and justify termination.

The contract was to refurbish 150 dwellings in 24 blocks on a rolling programme. The contractor was allowed possession of three blocks at any one time and the renovation of each individual block was programmed to take 9 or 10 weeks. Progress on the first three blocks was severely delayed and each took in the order of 40 weeks to complete. It appears that there were grounds for an extension of time for short delays but not anywhere near the enormous over-run actually incurred. Both the Court of first instance and the Court of Appeal were satisfied that the contractor had failed to proceed diligently. It was not however alleged that the contractor had failed to proceed regularly. It was apparently accepted that the contractor had provided sufficient men and materials to complete the work but that progress was extremely slow because they were disorganised and inefficient.

The report on this case includes reference to the decision in **London Borough of Hounslow v. Twickenham Garden Developments Ltd.**<sup>178</sup> The facts are not entirely clear from the BLR commentary but the contract had been interrupted by labour troubles and an 8 month strike. The judge in this case refused an injunction for the removal of a contractor from site following determination for failure to proceed. Megarry J made the following comments regarding the meaning of the words 'regularly and diligently' as found in clause 25 (1) (b):

*'These are elusive words, on which the dictionaries help little. The words convey a sense of some activity, of orderly progress, and of industry and perseverance: but such language provides little aid on the question of how much progress and so on is to be expected. They are words used in a standard form of building contract in relation to functions to be discharged by the architect and in those circumstances it may be that there is evidence that could be given, whether of usage among architects, builders and building owners or otherwise, that will be helpful in construing the words. At present all I can do is to say that I remain somewhat uncertain as to the concept enshrined in these words ...'*

There was apparently a dispute between the employer and the consultants on the one hand and the contractor on the other as to what had actually happened on site. The judge was apparently not convinced that the contractor had failed to proceed regularly and diligently. The judge said that *'... although the borough has established that some sort of case for having validly determined the contract, that case falls considerable short of any standard upon which, in my judgment, it would be safe to grant this injunction on motion'*. The judge also said that the case involved *'so much turning on disputed questions of fact, and inferences from facts'*

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<sup>178</sup> **London Borough of Hounslow v. Twickenham Garden Developments Ltd** [1971] Ch 233.



and described what he was being asked to decide as the '*application of an uncertain concept to disputed facts*'. The judge dismissed the employer's application for an injunction for the removal of the contractor.

Reference is also made to a decision from the Supreme Court of the Northern Territory of Australia in **Hooker Constructions PDY Ltd v. Chris's Engineering Contracting Company**.<sup>179</sup> In considering the meaning of the words '*to proceed with the works with reasonable diligence*' Blackburn J said this;

*'I think that a sensible commercial construction of the phrase is that the actual extent of work completed is of some significance. 'Diligence' in this context means it seems to me, not only the personal industriousness of the Defendant himself but his efficiency and that of all those who worked for him ... Moreover, it would be wrong to insist that 'reasonable diligence' refers only to the personal characteristics of individuals, and that evidence of the actual conduct or misconduct of the Defendant and his servants is only relevant, to the exclusion of evidence of the actual state of the work at a given time.'*

The BLR commentary also refers to text book references and finds them of limited help.

Derek Walker Smith and others<sup>180</sup> say, in respect of the words 'regularly and diligently': '*it is impossible to define helpfully the word 'diligently'. The provision merely stresses what would otherwise be an implied term of the contract namely, that the contractor should show that degree of despatch and exertion which would reasonably be expected of his calling.'*

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<sup>179</sup> Hooker Constructions PDY Ltd v. Chris's Engineering Contracting Company [1970] ALR 821.

<sup>180</sup> Walker-Smith Derek, (1975) and others, Standard Forms of Building Contract, Charles Knight.



Keating<sup>181</sup> refers to the Hounslow case and says: *'failure to comply with programme is not itself a breach of contract but it may be some evidence of failure to proceed regularly and diligently'*.

The Building Contract Dictionary<sup>182</sup> states that the phrase 'regularly and diligently': *'probably means more than an express restatement of the contractor's common law obligation to progress, ie it must bear some relationship to a specified date of completion. Whether or not the contractual standard is achieved is probably to be judged by the usage of the Construction Industry, and in the light of related terms of the Contract.'*

After a quote from Hounslow the Dictionary continues: *'the number of workmen on the site and the amount of plant and equipment there are relevant factors in considering whether or not the contractor is making regular and diligent progress. The Architect must look at the master programme, the work done and to be done, the time available, the labour and the contractor's capacity or ability to do the work. A slow rate of progress judged against the performance of other contractors is an indicator that the contractor is not proceeding 'regularly and diligently' though low productivity on site may well be explained by other factors which are outside the contractor's control ...'*

The AJ Handbook<sup>183</sup> states: *'failure to comply with an agreed programme may be some, but certainly is not conclusive, evidence of failure to proceed regularly and diligently. Thus the failure to comply with the programme may be due to the contractor's default, or a cause of delay (warranting and extension), or it may be that the contractor is proceeding at a rate and in a manner which satisfies his obligation to*

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<sup>181</sup> May Anthony J, (1991) QC, Keating on Building Contracts, (5th Edition), Sweet & Maxwell.

<sup>182</sup> Powell-Smith Vincent and Chappell David, (1985) The Building Contract Dictionary.

<sup>183</sup> Architectural Journal's Legal Handbook (1988).

*proceed regularly and diligently even though it differs from the programme.'*

All of this illustrates the difficulty inherent in establishing whether the contractor, or sub-contractor, is in breach of contract. There is much uncertainty about the interpretation of the contractual terms relating to progress. The decided cases and in particular the advice in the AJ Handbook reinforce the contention that the employer and its advisers do not take sufficient interest in the matters of programme and progress to enable them to make categorical assertions regarding a failure to progress the works at a satisfactory pace.

#### **2.4.19. The Society of Lloyds v. Kitsons Environmental Services and Others.<sup>184</sup>**

This action arose out of the refurbishment of the Lloyds 1958 building. The refurbishment was carried out under a construction contract, dated 1st November 1988, between The Society of Lloyds and Fairclough Building Ltd.

There were disputes under the construction contract and substantial claims relating to delay and disruption. Fairclough commenced arbitration in respect of these disputes however they were settled. The claims against Kitsons were in respect of the failure to remove asbestos during an enabling works contract. The claims against the architect and engineer included claims relating to a failure to ensure that asbestos was removed and failure to provide design information of adequate quality and in good time.

The original writ was against Kitsons alone. Later a separate writ was issued against the designers. Subsequently the two actions were

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<sup>184</sup> The Society of Lloyds v. Kitsons Environmental Services and Others. (QBD 1994) Unreported. (The Others were more particularly the architect DEGW, the list of defendants included each partner, and the engineer Oscar Faber).

consolidated. The Consolidated Statement of Claim occupied some 41 pages and had 8 schedules occupying 172 pages and there were a further 480 pages of Further and Better Particulars and a Scott Schedule of 70 pages and 3 appendices. The Scott Schedule addressed, in particular, the delay claims.

There was a summons on the part of DEGW to strike out parts of the Consolidated Statement of Claim and of the Scott Schedule and/or for the provision of further and better particulars and/or that the action be dismissed. There was also an application from Faber to strike out parts of the pleading. The applications included 4 grounds.

The first ground related to the settlement with Fairclough. So far as the time claims are concerned this first ground appears to have included an argument that the claim, by implication, was that but for the alleged defaults the project would have been finished at an earlier date and that that date should be pleaded. The claim was not pleaded on that basis and the judge noted that the Scott Schedule contained information in respect of specific delays.

The second related to sections of the pleading which alleged default but for which no loss was claimed.

The third was that allegations against DEGW in respect of the asbestos matters lacked any basis in law.

The fourth ground, the ground relevant to the time claims, related to the particularisation of the allegations generally in that they failed to particularise:

- the breaches of contract and/or negligence relied upon;
- the factual consequences of each and every several breach and/or act of negligence alleged;



- the financial consequences of each and every factual consequence alleged.

Having concluded that Lloyds case was that DEGW issued information late or altered it after issue DEGW said that that allegation should be clearly pleaded and:

*'(1) each relevant piece of information specifically*

*identified;*

*(2) clear allegations made as to when each such piece of*

*information:*

*(a) was issued;*

*(b) should have been issued;*

*(c) the facts matters relied upon in support of the*

*allegation that it should have been issued at the time  
alleged;*

*(d) if a piece of information was altered after*

*issue:*

*(i) when it is alleged that that happened;*

*(ii) why it is alleged that that should not*

*have happened;*

- (3) *the factual consequences of a piece of information being issued when it was, or changed when it was, should be clearly pleaded, so as to show whether it is alleged only that some particular operation was affected (and if so what) section of the Works was affected or that the whole of the Works was affected;*
- (4) *the financial consequences of the alleged factual consequences should be clearly pleaded'.<sup>185</sup>*

In the event the judge was satisfied that the Scott schedule provided an adequate explanation of the allegations but that the Defendants could request further and better particulars if they wished.

The time claims were pursued and particularised on a descriptive rather than an analytical basis<sup>186</sup>. The allegations against the designers had been framed in a way which grouped together defaults in respect of the activities on the contractors programme and reflected complaints made by FBL in its claim. This meant that rather than having independent allegations in respect of each late drawing, instruction, variation, etc there was a single allegation of, for example, a failure to provided setting out information on time. That allegation was supported by reference to late issue of drawings, instructions, variations, etc and other relevant facts.

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<sup>185</sup> Taken from the Defendant's written Skeleton Argument.

<sup>186</sup> It is acknowledged that some form of critical path analysis would have been required to prove the impact of the delays, including the impact on the completion date. It was anticipated that this would be provided by way of expert evidence.

This is in contrast to the approach adopted in *ICI v. Bovis*<sup>187</sup> and the basis upon which FBL had, on the advice of their solicitors Masons, sought to pursue its claims<sup>188</sup>. The approach of aggregating of delaying influences was attacked by DEGW who sought particulars in respect of each piece of information allegedly provided late. Obviously to do so would be to be driven back to the *ICI v. Bovis* information overload position.

For each allegation, the Scott Schedule provided details in respect of:

- nature of the complaint with reference to particular drawings, instructions and variations;
- the principal activity delayed and other activities affected;
- nature of the effect on the activities in terms of delay and disruption;
- dates when the activity should have taken place and when it did;
- the dates between which the alleged default occurred;

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<sup>187</sup> Although the claims in *ICI v. Bovis* were never actually struck out the Plaintiff was effectively forced to settle the matter because the time claims were, despite numerous attempts at further particularisation, incapable of being resolved on the basis which had been adopted. The Plaintiff had attempted to make separate allegations in respect of each and every late piece of information. ICI had an impossible task when it tried to allocate the losses to each allegation. In the event this led to the delightful but absurd allegation that the late issue of information for an alarm bell caused a loss of some £750,000. There were extensive schedules which listed every drawing revision and other instruction giving the date of issue, the date when the information ought to have been issued and calculating a delay on that basis. Having provided this level of detail ICI were unable to relate this to the delays suffered on the project. This was a classic case of information overload. Having identified the lowest level of design information issue which was potentially delay (or disruption) causing to the contractor it became impossible to allocate any specific loss. Such a dis-aggregation of potentially delaying influences is self defeating. Taken in isolation any individual piece of design information is unlikely to cause delay.

<sup>188</sup> This approach was similar to that used by ICI. The Contractor had recorded details of each drawing issue, each instruction and every piece of relevant correspondence in a database. The information recorded included date of issue, description of change, areas of the building affected, programme activities affected etc. This had not, however, been done on a qualitative basis (that is there was no distinction between those items of information which were significant and those which were not) and there was no attempt to distil the effect of the changes on the programme. There was an attempt to utilise this data in the claims against the consultants but this had to be abandoned.



- the dates when the delay was effective and the amount of delay caused to the activity;
- the amount of delay caused to the project (critical delay);
- the amount of time related losses and disruption claimed.

In preparing the pleaded case leading counsel had been concerned to identify the critical path through the project and the critical delays. Leading counsel took the view that a judge would not find the concept of concurrent critical paths or concurrent critical delays attractive.

A bar chart was provided which showed the original activity durations, the actual durations, the periods of delay and the critical path through the delays.

In the event the information provided was adequate to avoid either striking out or a specific order for further particulars.

#### **2.4.20. John Barker Construction Limited v. Portman Hotel Limited<sup>189</sup>.**

The Plaintiff, the contractor, carried out refurbishment work to the London Portman Hotel. The work was delayed and there was an acceleration agreement. Further delays occurred and the contractor sued for greater extensions of time and payment in respect of the acceleration agreement. The matter was referred to the courts as the arbitration clause had been deleted. Although not formally reported two commentators have referred to this case each giving a slightly different emphasis.

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<sup>189</sup> This case was initially un-reported. The judgment was delivered by Mr Recorder Roger Toulson QC, sitting as Official Referee, on 16th April 1996. Two commentators have referred to the case Tony Bingham, Building 3rd May 1996 page 30 and Robert Fenwick Elliott, Fenwick Elliott Review Summer 1996 page 18. The decision was subsequently report at (1996) 12 Const L J 277 and (1996) CILL 1152.

Tony Bingham reports<sup>190</sup>, particularly, on the dangers of deleting the arbitration clause.

He also tells us that the judge decided that the architect's assessment of the extension of time was flawed in a number of respects. For example:

- the architect did not carry out a logical analysis in a methodical way to show the impact an event had or was likely to have on the builder's programme;
- the architect made an impressionistic rather than a calculated assessment of the time he thought reasonable for the various items;
- the employer knew of the nature of the architect's assessment, but decided against seeking any more detailed analysis unless the contractor decided to sue;
- the architect misapplied the contractual provision, particularly in respect of the SMM and BQ;
- where the architect did award time it bore no logical or reasonable relation to the delay caused.

The first three points are particularly relevant to the form of analysis. The first two points highlight the need for a methodical approach. It may be that the last item would suggest that an entirely prospective approach would not find favour.

Robert Fenwick Elliott gives further commentary<sup>191</sup>. The issues and findings are set out as follows:

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<sup>190</sup> Building 3rd May 1996 page 30.

<sup>191</sup> Fenwick Elliott Review Summer (1996) page 18.

- What is the implied obligation on a certifying Architect: To act lawfully and fairly.
- What are the powers of the Court if the Architect fails to act lawfully and fairly: The Court may declare the Architect's decision invalid, but may not substitute its decision for that of the Architect solely because it would have reached a different decision.
- What is the power of the Court if the arbitration machinery breaks down: The Court may substitute its own machinery to ensure enforcement of the parties' substantive rights and obligations that a fair and reasonable extension should be given.
- Where the certification is challenged, will the Court embark upon a detailed examination of the way in which the Architect made this certificates: The Court made such an examination in this case.
- What was the effect of the Architect making an impressionistic assessment, instead of a logical analysis, of the delay: It rendered his extension of time fundamentally flawed. The contractual machinery had broken down to such an extent that the Court would substitute its own assessment.

The following commentary was provided:

*'The approach of the Court in this case differs somewhat from the approach of the Court of Appeal in Balfour Beatty v Docklands Light Railway in two important respects, albeit that the end result is much the same. First, the Court did not in this case pick up the implied term from the Balfour Beatty case, that certificates must not merely be 'honest' and 'fair' but also 'reasonable'. Secondly, Mr Recorder Toulson took a different line as to the effect of a failure of the certifier to meet the certified standard. In the Balfour Beatty case, the Court of*



*Appeal said that the courts do not have power to review certificates, and said that the remedy of an aggrieved contractor is to sue for damages for breach of contract. In this case, Mr Recorder Toulson latched on to the exception to the Crouch Rule referred to in Crouch itself, namely that the Court does have power to review certificates where the contractual machinery has 'broken down'. But reading the full judgement in this case suggests that the certification process ran along fairly typical lines; Mr Recorder Toulson described the failure of the architect to perform a proper retrospective<sup>192</sup> delay analysis as a fundamental flaw, and yet in practice, it is the exception rather than the rule for architects to make such an analysis<sup>193</sup>.*

*'Another point of apparent criticism of the architect was his acknowledgement that it was 'unfortunate' that he had discussed his proposed award with the employer, giving the employer the opportunity of comment, without offering a comparable opportunity to the contractor. Again, such behaviour on the part of architects is typical<sup>194</sup>.*

By way of evidence, the contractors came to court armed with a detailed delay analysis, but the employers did not. The court adopted the line of *McAlpine v. McDermott*<sup>195</sup> that such an analysis was necessary, and adopted the contractor's analysis subject only to some minor points. This pointed out a procedural issue; that the Court does not ordinarily have the means to perform very complex computer-aided calculations that are needed in retrospective delay analysis, and the contractor's

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<sup>192</sup> It is likely that the judge is referring to an analysis carried out after the event rather than one which adopted retrospective or hindsight pricing of the delay.

<sup>193</sup> This is consistent with the findings of this research.

<sup>194</sup> This is consistent with the findings of this research. Further some forms of appointment for consultants makes it a requirement that the certifier consult with and obtain the employers approval to any extension of time.

<sup>195</sup> *McAlpine Humberoak Ltd v. McDermott International Inc (No 1)* (CA 1992) 24 ConLR 68.

expert, Keith Pickavance, was effectively asked to go away and run the adjustments indicated by the court through his computer program.

It appears that the Defendant took a similar view to the architect in its approach to the analysis. The judge apparently took the same view of the defendant's approach as he did of the architect's. Faced with a choice it is clear that the court will prefer the logical analysis carried out in a methodical way to show the impact an event had or was likely to have on the programme rather to an impressionistic approach. As Robert Fenwick Elliott correctly observes this is just the approach adopted in **McAlpine v. McDermott**.

Reference to the work of Pickavance<sup>196</sup> confirms that the analysis approved by the Court was produced by him on a prospective basis.

#### 2.4.21. Summary of Section 2.4

The analysis of decided cases has identified the following basic principles:

- UK law takes the view that a contractor, or sub contractor is not entitled to rely on any programme which is not a contractual document. See for example the decision in **Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical**<sup>197</sup> where HH Judge John Newy QC declined to construe the contract in a way so as to incorporate a programme.
- Unless there are clear words to the contrary, there can be no presumption that any particular programme should automatically form the basis of any claim. The decision in **GLC v. Cleveland Bridge** as

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<sup>196</sup> Pickavance K, (1997) *Delay and Disruption in Construction Contracts*, LLP.

<sup>197</sup> **Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical**. (1989) 6-CLD-02-07 (Q.B. 1989) as set out more fully below.

applied in **Pigott Foundations v. Shepherd Construction** confirms that the contractor has a wide freedom to plan and execute his work to suit his own convenience.

- The notion that time claims can be presented on a global basis is not categorically supported by the two cases, **Crosby and Merton**, which are often quoted in support of that general proposition. On the contrary the decision in **McAlpine v. McDermott** and in **John Barker v. Portman Hotel** tend to show a preference by the courts for a detailed, logical analysis over the impressionistic.
- Those cases and interlocutory decisions which have been primarily concerned with particularisation provide assistance in indicating the level of detailed analysis which is likely to be necessary to clear the evidential hurdle. This is particularly so in respect of **ICI v. Bovis and Lloyds v. Kitsons and Others**. It is contended that, although these claims involved designers, the principles which can be derived from the judgements are of universal application. Any allegation of delay should include the following information:
  - term or terms of contract breached and/or relied upon;
  - nature of the complaint with reference to particular drawings, instructions and variations;
  - the principal activity delayed and other activities affected;
  - nature of the effect on the activities in terms of delay and disruption;
  - dates when the activity should have taken place and when it did;
  - the dates between which the alleged default occurred;



- the dates when the delay was effective and the amount of delay caused to the activity;
  - the amount of delay caused to the project (critical delay);
  - the amount of time related losses and disruption claimed.
- The decision in **Balfour Beatty v. Chestermount** confirms that a non-culpable delay occurring in a period of otherwise culpable delay should be measured on a net rather than a gross basis. This would tend to dismiss any analysis premised on an ultimately critical basis.

## 2.5. Case Law on Particularisation

The separate area of law regarding the particularisation of claims generally was made particularly relevant to delay claims by the decision in **Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2)**.<sup>198</sup> As noted above, the decision in that case was that an extremely large claim in connection with delay to a construction project in Hong Kong was dismissed because an abuse of process rather than because of insufficient particularisation.

Subsequent decisions have, however, put the matter of particularisation into clearer focus.

The decision in **British Airways Pension Trustees v. Sir Robert McAlpine and Sons Ltd**<sup>199</sup> tends to reduce the prospect of striking out. British Airways Pension Trustees (BAPT) were the funders of a development in Croydon. The defendants were the contractor, McAlpine, and the architect, Project Design Partnership (PDP). It was alleged that

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<sup>198</sup> **Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2)**. (JCPC 1991) 52 BLR 1.

<sup>199</sup> **British Airways Pension Trustees and British Airways Pension Trustees Ltd. v. Sir Robert McAlpine and Sons Ltd. and Others** (CA 1994) *The Times*, 12 December 1994; CILL March 1995 Page 1022; (1994) 72 BLR 26.

McAlpine and PDP caused defects in the building that led to a diminution in value of the building. BAPT sold its interests in the property for some £9.95 million and alleged in proceedings against McAlpine and PDP that if the property had been defect free, they would have sold the property for £12.6 million. BAPT claimed the diminution in value and associated investigation costs against McAlpine and PDP.

The pleading at that time consisted of a schedule of defects, all of which BAPT alleged contributed to the diminution in value. BAPT had made no attempt to assess the cost of remedying each of the defects, to link that to the diminution in value, nor to ascribe any particular defect to either defendant. The defendants applied to have the claim struck out for lack of particularisation. In November 1992, Judge Fox-Andrews struck out the Statement of Claim and BAPT appealed to the Court of Appeal.

The Court of Appeal reversed the first instance decision. Saville LJ stated as follows:

*'The basic purpose of pleadings is to enable the opposing party to know what case is being made in sufficient detail to enable that party properly to prepare to answer it. To my mind it seems that in recent years there has been a tendency to forget this basic purpose and to seek particularisation even when it is not really required. This is not only costly in itself, but is calculated to lead to delay and to interlocutory battles in which the parties and the Court pore over endless pages of pleadings to see whether or not some particular point has or has not been raised or answered, when in truth each party knows perfectly well what case is made by the other and is able properly to prepare to deal with it. Pleadings are not a game to be played at the expense of the litigants, nor an end in themselves, but a means to an end, and that end is to give each party a fair hearing ... Thus general statements to the effect that global or composite claims are*

*embarrassing and justify striking out, to be found for example in Hudson 11th Ed. paragraphs 8-204, are not automatically applicable to every case.'*

It seems to have been quite clear in Saville LJ's view that the defendants in this case knew perfectly well what case they had to meet:

*'The alleged defects were set out in some detail. McAlpines and PDP had been on site for a considerable time after practical completion and so had their own means of knowledge of the alleged defects. Thus it seems to me that it can hardly be said that these defendants were in any real fashion placed in a position where they were unable to know what case they had to meet or were facing an unfair hearing.'*

This decision appears to apply to construction projects in general where the parties to any subsequent litigation are likely to have been involved with the project on a day to day basis during the construction work. From the point of view of particularisation there is a parallel here with delay claims, there being a number of causes contributing an overall effect.

The recent decision in **GMTC v. Yuasa Warwick Machinery**<sup>200</sup> appears to reinforce this position by again reducing the prospect of obtaining an order for the provision of extensive particulars. In this case the trial judge had ordered that the Plaintiff should produce a Scott Schedule. At first the Plaintiff sought to comply with the order but was unable to fit its case to the pro forma prescribed. The Court of Appeal found that the trial judge was wrong to seek to *'prescribe the way in which quantum of damage is to be pleaded and proved'*. Thus an order for particulars may be avoided but the case will in the end have to be made out. What is not provided as particulars may have to be provided by way of expert

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<sup>200</sup> GMTC Tools and Equipment Limited v. Yuasa Warwick Machinery Limited. (CA 1994) CILL 1010.



evidence. This may significantly delay the point at which a meaningful exchange relating to the method of proving delay can take place.

It is important to bear in mind the comments of Lord Justice Simon Brown; *'Whether that claim will prosper remains to be seen; undoubtedly certain difficulties attend it but those are for the future. For the present, in common with my Lord, I believe that they should be allowed to advance them. It breaches no 'unless order', it is not obviously unsustainable, it is sufficiently particularised, the defendants have suffered no prejudice consequent upon the proposed amendment.'*

This decision was reported just after a potentially important Practice Direction was handed down by the Lord Chief Justice on 24th January 1995. This requires that Order 18 Rule 7 of the Rules of the Supreme Court be strictly enforced. The opening paragraph of the rule states *'every pleading must contain, and contain only, a statement in a summary form of the material facts on which the party pleading relies for its claim or defence, as the case may be, but not the evidence by which those facts are to be proved, and the statement must be as brief as the nature of the case admits.'*

This then is the crux. To provide an analysis which will satisfy the need to plead a clear and concise case, contain sufficient material to avoid complaints about a lack of particularisation and yet avoid unnecessary detail and complexity.

Whilst the course of cases, which include Wharf<sup>201</sup> through to GMTC, have focused attention on the particularisation of claims generally they have neither altered the need ultimately to prove a case or provided much assistance to those seeking to prepare the evidence.

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<sup>201</sup> Wharf Properties Ltd and Another v. Eric Cumine Associates and Others (No 2). (JCPC 1991) 52 BLR 1.

In the event the cases dealing with particularisation add nothing to the principles which may be derived from the cases generally.

## 2.6. Summary of Chapter 2

Section 2.2 examined the development of Schedule Impact Analysis using Computer Scheduling Techniques in the USA. The review provided information about a number of approaches and methods of analysis and has provided a framework within which any methodology would be required to function. Each of the methods in use are described and reviewed in detail.

Section 2.2 also developed the general principles derived from the examination of the development and use of Schedule Impact Analysis using Computer Scheduling Techniques in the USA. This revealed that there are three distinct approaches to time analysis (i) prospective, (ii) contemporaneous, and (iii) retrospective. For each approach there are a number of methods available which range from simple to extremely complex. The research suggests that the general principles of the techniques can be used to develop a systematic approach to Schedule Impact Analysis using Computer Scheduling Techniques in the UK. It may be that development in the UK will need to start at the beginning or at some intermediate point rather than simply adopt the methods currently in use in the USA.

Section 2.3 examined the published material relating to the use and development of Schedule Impact Analysis using Computer Scheduling Techniques in the UK. The review of these works provided the opportunity to distil the principles which should inform the choice of approach appropriate for use in the UK. This revealed that the volume and depth of material available in the USA is far greater than that available in the UK. This research shows that there are differences, particularly in the approach to construction project planning, which mean

that it may not be possible to simply copy the methods of analysis which have found favour in the USA. These differences are likely to act as a constraint to the development of an approach for use in the UK. These differences and constraints will have to be accommodated in developing the theoretical concepts in Chapter 3. Section 2.3 also includes a review of the recent UK works and seeks to draw conclusions from them in respect of the appropriate approach to analysis:

- There is little by way of published works of reference which deals with practical application, within the UK, of the type of schedule impact analysis techniques commonly used in the US. With the exception of the book by Pickavance<sup>202</sup> recent works published on the subject deal with the techniques on a theoretical basis;
- In order to draw conclusions in respect of the appropriate approach to analysis it was also necessary to explore the concepts of causation and concurrency;
- So far as causation is concerned it was found that the following principle can reasonably be inferred:

*'the purpose of the grant of an extension of time is to seek to put the contractor in the position it would have been in had the delaying event not occurred'*

- Any such general rule is of course subject to any express provisions of the contract. The inferred rule would indicate a need to:
  - have a resolved view of what would have happened had the delaying event not occurred; and
  - properly take account of alternative causes;

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<sup>202</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts, LLP.



- It is contended that a method of analysis which incorporates a practical and common sense approach to the resolution of concurrency is required. It is further contended that any approach which seeks to review, match and analyse individual delaying events in isolation is doomed to failure through complexity. An approach which takes a broad, project wide, view of concurrency and which can bring a proper balance to the notions of fairness, weight and/or dominance and common sense is one which will, ultimately, prevail.
- In dealing with concurrency it is concluded that where there are a number delays caused by each party and those delays are of approximately equal efficacy the overall effect of the aggregate of those delays may be 'netted off'. Discounting for concurrency will be achieved by an overall adjustment based on the total amount of delay caused by each party.
- It is important, in considering the overall impact of delays, that the analyst take a view as to which delays are real and effective as opposed to those which are simply progress related events or immaterial matters which can be discounted as effective causes of delay. Only experience can assist the analyst in making this choice.
- The overall conclusions drawn in Section 2.3 are that:
  - the retrospective approach to delay analysis is the most appropriate for use in the UK;
  - if adequate information is available the contemporaneous approach can be used during project performance;
  - in certain circumstances the prospective approach may be used.

Section 2.4 analyses the decided cases relevant to the presentation of delay claims and identifies the principles of law and practical application

which are to be derived from them. The analysis of decided cases has identified the following basic principles:

- UK law takes the view that a contractor, or sub contractor is not entitled to rely on any programme which is not a contractual document.
- Unless there are clear words to the contrary, there can be no presumption that any particular programme should automatically form the basis of any claim.
- The notion that time claims can be presented on a global basis is not categorically supported by the two cases, **Crosby and Merton**, which are often quoted in support of that general proposition. On the contrary the decision in **McAlpine v. McDermott** and in **John Barker v. Portman Hotel** tend to show a preference by the courts for a detailed, logical analysis over the impressionistic.
- Those cases and interlocutory decisions which have been primarily concerned with particularisation provide assistance in indicating the level of detailed analysis which is likely to be necessary to clear the evidential hurdle. This is particularly so in respect of **ICI v. Bovis** and **Lloyds v. Kitsons and Others**. It is contended that, although these claims involved designers, the principles which can be derived from the judgements are of universal application. Any allegation of delay should include the following information:
  - term or terms of contract breached and/or relied upon;
  - nature of the complaint with reference to particular drawings, instructions and variations;
  - the principal activity delayed and other activities affected;

- nature of the effect on the activities in terms of delay and disruption;
  - dates when the activity should have taken place and when it did;
  - the dates between which the alleged default occurred;
  - the dates when the delay was effective and the amount of delay caused to the activity;
  - the amount of delay caused to the project (critical delay);
  - the amount of time related losses and disruption claimed.
- The decision in **Balfour Beatty v. Chestermount** confirms that a non-culpable delay occurring in a period of otherwise culpable delay should be measured on a net rather than a gross basis. This would tend to dismiss any analysis premised on an ultimately critical basis.
  - As a matter of principle any entitlement to delay must be based on the impact to the project completion date and not a comparison between planned and actual completion dates in respect of individual activities.

Section 2.5 analyses the decided cases relevant to the particularisation of claims in general and identifies the principles of law and practical application which is to be derived from them. In the event the cases dealing with particularisation provide little or no direct assistance in regard to the form that any analysis ought to take. The necessity to provide an analysis which will satisfy the need to plead a clear and concise case, contain sufficient material to avoid complaints about a lack of particularisation and yet avoid unnecessary detail and complexity is identified.



Having reviewed the current literature and reports on decided cases in Chapter 2 this will form the basis of the exposition of the theoretical concepts which is set out in Chapter 3.

## **Chapter 3 Theoretical Concepts**

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### **3.1. Introduction**

Chapter 3 will distil and develop the theoretical concepts and general legal principles using the analysis of current literature and cases set out in Chapter 2 as a basis. This distillation and development of the theoretical concepts will form the basis of the comparison between theoretical concepts and current practice which will follow in Chapter 5.

Section 3.2 will set the scene by examining the general legal principles as related to the time for completion of construction contracts and the way in which they are incorporated in construction contracts.

Sections 3.3, 3.4 and 3.5 will examine the way in which it may be anticipated that claims might arise.

Section 3.6 will develop the principles of analysis which were identified in Chapter 2.

Sections 3.7, 3.8 and 3.9 will consider the preparation of the various schedules required to demonstrate delay.

Sections 3.10 and 3.11 will consider the basic requirements of the analysis and the presentation of the results.

Section 3.12 will provide a summary of Chapter 3.

### **3.2. The Construction Contract and the Time for Completion**

If a contract for the supply of goods or services does not specify a time for performance, a reasonable time will be implied. As time is important to the parties to a construction contract it is usual for the time for performance or completion to be the subject of express conditions.



In construction contracts the time for performance is usually specified in terms of a final date or an overall period for completion. Intermediate dates for the completion of sections may be incorporated. Sub-contracts may specify a final date, an overall period, a particular sequence of performance or require the sub-contractor to perform as directed by the main contractor. This latter form is often referred to as a 'beck and call'<sup>1</sup> contract.

In order to determine a project duration assumptions have to be made about a number of factors including the performance of the parties. These will, in the main, relate to the timeliness and adequacy of information or things provided by the employer (and his consultants acting as agent) on the one hand and that of the contractor and his sub-contractors on the other. The terms of the contract seek to underwrite those reasonable assumptions. Where the express terms fail to mention such matters implied terms may be inferred.

It is usual for construction contracts to include extension of time and loss and expense provisions, although the right to common law damages is not normally excluded.

A claim in respect of losses relating to the time for performance of construction work may arise in several ways. Those most commonly encountered in the construction industry are:

- claims by employers against contractors for damages due to late completion;
- claims by contractors against employers for loss and expense due to their being prevented from completing by the due date;

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<sup>1</sup> See *Martin Grant & Co Ltd v. Sir Lindsay Parkinson & Co Ltd*. (CA 1984) 29 BLR 31.

- claims between contractors and sub-contractors for loss and expense due to their being prevented from completing by the due date;
- claims by employers against consultants in respect of their own losses and/or loss and expense payments to contractors resulting from late completion due to defaults by the consultants. Here the expression consultants is intended to cover organisations or individuals providing construction management<sup>2</sup> and project management services;
- claims by consultants against employer in respect of additional fees for supervision etc.

Some may consider the first and second items to be different sides of the same coin. In reality the two often interact as claim and counterclaim. For the purposes of this work the second and third items can, in respect of the principles of analysis, be considered together<sup>3</sup>. Where different principles apply these are detailed in the text.

In order to succeed with any claim it is necessary for a plaintiff to construe the contract and identify and apply the relevant terms in a way which brings his claim within them.

The extension of time provisions in a contract will anticipate that delay may be caused by a number of matters. Some of those matters relate to neutral causes or causes which arise out of some act which is permitted by the contract others will arise out of the breach of a provision.

Where there are terms which anticipate the matter complained of, any requirements as to, for example notice, must be met. The party making the claim must show that the matters complained of caused the alleged

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<sup>2</sup> In some respects the services of a construction manager may be more akin to those of a contractor than a designer. This will be a matter of interpreting the particular agreement for services.

<sup>3</sup> There may be different factual grounds applicable to the contractor and the sub-contractor. There may be delay which is critical to the completion of a sub-contract but not to the over project completion.

delay and that that delay caused a delay to the completion of the project and not just to an individual activity or a group of activities.

Examples of neutral causes or causes which arise out of some act which is permitted by the contract include:

- inclement weather;
- additional work.

Examples of breaches of a term of the construction contract would include:

- failure to give possession of the site or any part of it;
- late provision of owner supplied materials or equipment;
- late provision of information or instructions.

There may also be delaying events which are neither anticipated by the terms of the contract or flowing from a failure to comply with them.

### **3.3. Claims by Employers Against Contractors**

Unless certain things happen the contractor is required to complete the project by the completion date set in the contract. Employer's damages for delay are covered by damages provisions. These provisions will either set out the rate of damages and the machinery by which the damages are applied or provide for actual damages to be deducted subject to proof. These provisions may relate to the project as a whole or provide for sectional completion with separate completion dates and damages for each section.



An employers right to recover damages will simply arise by default. If the contractor finishes late and the contractual provisions have been properly applied, the employer may simply deduct damages at the appropriate rate. Where the damages are unlimited the actual loss, subject to proof, will be deducted.

Here the contractual requirement is to meet the completion date of the project or a section, breach is the failure to complete by that date, the damage is measured by taking the period of time between the date when the contractor should have completed<sup>4</sup> and the actual date of completion, and applying the appropriate rate of damages.

From this it can be seen that no formal delay analysis will be required for an employer to succeed on a claim for damages. Here the failure to complete is self-evident and, in the absence of a defence from the contractor which shows that he is entitled to an extension of the time for performance, the employer will succeed. No further proof by the employer of fault on the part of the contractor is required. Thus the employer will likely always retain an evidential advantage, as against the contractor, in respect of disputes concerning delay. Unless the employer were to commence proceedings in an attempt to reduce the amount of time already granted he will always be in the position of defending a claim pursued by the contractor. When the contractor is the plaintiff the burden of proof will be with him.

#### **3.4. Contractors and Sub-Contractors Claims**

By contrast a contractor or sub-contractor seeking to prove entitlement to an extension of time and loss and expense will have to bring his claim within the terms of the contract and identify a breach by the employer or contractor of the term(s), demonstrate what delay was caused by the breach and the loss that was suffered as a result of that delay.

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<sup>4</sup> Subject to any extension of time granted.

The required performance will be shown by reference to express or implied term(s) of the contract. Failure to perform as anticipated by the term(s) by, for example, issuing instructions for additional or varied work, or failure to perform in accordance with the term(s) by, for example, the late release of information, failure to give possession of the site or failure to provide owner or contractor supplied material or equipment on time, will constitute the breach.

The damage is measured by taking the amount of time lost as a result of the breach(es) and then applying the appropriate rate of time related expenditure. The identification of duty and breach may be reasonably straightforward and, once the additional time entitlement is established, the resulting loss is relatively easy to determine.

### **3.5. Employers Claims Against Consultants**

Consultants are employed to develop the clients needs into a design brief, develop that brief into a design proposal, provide advice about the construction process and carry out the design and administration of the construction work. The construction contract places onerous requirements upon the employer to provide construction information. Those requirements will normally be satisfied by consultants acting on the employer's behalf as his agent. The employer will enter into an agreement with the consultants covering those services. It will probably not occur to the employer that whilst a consultant may delay the project by his tardy performance there are no provisions within the consultant's agreement dealing with the time for performance of the consultant's duties. This position stands in stark contrast to the provisions in the construction contract regarding time for performance both on the part of the contractor and the employer.

Where an employer has an award against him in respect of a loss and expense claim and has suffered his own direct losses, which he perceives as due to failure on the part of his consultants, he may seek a remedy



against them. Here the employer will have to show that the consultant was instrumental in causing the breach of the construction contract and that that was a breach of the consultants contract with the employer and/or that the consultant acted in a negligent way. This may be difficult when the consultant, often acting as judge in his own cause, may have missed, confused or obscured the true influences to performance.

An employer will be faced with evidential difficulties if, as is often the case, the main contract claims have been compromised rather than having been the subject of a formal determination. Here he may also be faced with the task of establishing the delay by undertaking the analysis which the contractor was, by the settlement, saved from completing<sup>5</sup>.

Similarly procurement forms which involve the use of package contractors, rather than a main contractor, whose claims are dealt with separately may leave the employer without the comprehensive analysis necessary to evidence default on the part of the consultants. This is a common feature of both *Wharf Properties*<sup>6</sup> and *ICI v. Bovis*<sup>7</sup>.

### 3.6. The Principles of Analysis

Before a claim can be brought it is necessary to analyse the time requirements of the project. The analysis should establish the total time requirements of the project, isolate the cause(s) of delay<sup>8</sup> and identify any contract term(s) breached. The need to consider the impact of any change or variation to a construction project may arise before or at the time of any such change or variation. The need may also arise after project completion. The resolution of such matters may at the time of the

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<sup>5</sup> Where there has been a compromise the employer is likely to have been consulted and if properly advised will have been aware of the potential risks.

<sup>6</sup> See *Wharf Properties Ltd and Another v. Eric Cumine Associates and Others* (No 2). (JCPC 1991) 52 BLR 1 Supra.

<sup>7</sup> See *Imperial Chemical Industries PLC v. Bovis Construction Ltd and Others*. (QBD 1992) 32 ConLR 90 Supra.

<sup>8</sup> In practice the analyst would also consider any disruption and acceleration which may have occurred.



variation or change be considered as a problem requiring a management solution and after project completion a matter of forensic analysis.

To the extent that time claims are resolved at the time of any variation or change such claims are less likely to result in a formal dispute. This work is therefore primarily concerned with the need for post event or forensic analysis. It is considered, however, that the basic principles would be equally applicable to any analysis of potential or actual delaying events.

In order to establish the additional time entitlement some form of time analysis is required. A full time analysis, carried out after the event, on a major construction project will be large and extremely complex. Such an analysis will be expensive and may take a number of months. On a £50m shopping complex that had been constructed in the centre of Bristol it took about 12 months and cost in excess of £1m to complete such an exercise. The project was completed in 1991 some 65 weeks late and at an additional cost of about £25m.

A time analysis has two distinct tasks to perform.

The first can be considered a purely mechanical exercise. This exercise should:

- identify delays against a baseline;
- provide an explanation for the delays; and
- identify the impact of the delays on the date for completion.

This is the factual analysis.

The second task is to resolve matters of causation. That is to establish liability for the delays and in particular resolve matters of concurrency. The contractual analysis.

Completion of the contractual analysis may be an iterative process. This iterative process may raise the need to revisit the factual analysis in order to resolve issues of causation.

It is essential that, as far as possible, the two tasks are considered separately. It would be wrong to allow the factual analysis to be adjusted to show a bias.

The first task can be achieved by a, largely, mechanical analysis of the factual data. The second task requires, to a large extent, the application of judgement.

The two parts of the analysis are often confused and it is important that the factual analysis does not anticipate the contractual analysis in a way which produces a partial answer. The factual analysis should measure and segregate all relevant causes of delay. Beyond this it will be necessary to identify the alleged breach(es) and other causes which led to the delays, resolve issues of concurrency and other matters of causation and demonstrate the overall impact on the date for completion. The particular words of the contract may result in there being a difference in the period of relief from liquidated damages and the period for recovery of loss and expense.

The true analysis will likely consist of four basic stages:

- establish what ought to have happened: typically represented by an As-Achievable chart;
- establish what actually happened: typically the as-built data;
- prepare an analysis and explanation of the differences between the As-Achievable chart and the as-built data;
- presentation of the results.

These basic parts can be presented in a number of different forms and can be used in several combinations.



It is considered that these parts are the minimum requirement to establish an entitlement to additional time.

### 3.7. The As-Achievable Chart

The As-Achievable chart is a programme which calculates the completion date which would have been achievable absent delays caused by either party.

An As-Achievable chart<sup>9</sup> will need to acknowledge many things and may not correspond either with the contractual completion date or the contractors original plan.

An As-Achievable chart may, subject to proof of adequacy, be based on the contractors original plan or on a plan produced after the event. The use of a chart produced after the event is a concept which is established in US law<sup>10</sup> and, it is contended, not contested in English law.

In preparing the As-Achievable chart allowance should be made for all matters which ought, having regard to the contractual provisions, to have been foreseen<sup>11</sup> as distinct from those items which, in fact, cause delay but

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<sup>9</sup> The expression 'as-achievable chart' may imply a higher standard of adequacy than is required under the contract. It is conceivable that a plan may comply with all of the contractors obligations but still not be achieve the intended object.

<sup>10</sup> See for example; Georgia Power Co. v. Public Serv. Com'n, 396 S.E.2d 562 (Ga.App. 1990). The court endorsed the use of a schedule prepared by a third party consultant after the project had started in preference to the schedule analysis prepared by the project owner; Thiess Properties Pty. Ltd. v Ipswich Hospitals Board (No.2), [1985] 2 Q.R. 318). The court accepted the testimonial description of the schedule given by the contractors project manager despite conflicts with the written, submitted, and approved schedule; C. Ernst, Inc. v. Manhattan Construction Co. of Texas, 387 F. Supp. 1001 (S.D.Ala. 1974). The court refused to use the contractors published schedule to measure delay as it was the contractors true intent to finish one year later.

<sup>11</sup> To be used to prove delay, the schedule and the underlying data must be reliable. A construction schedule combines many decisions about the proposed order of activities, their duration and their relationship with other activities. Individually and together these decisions must be complete, sensible, accurate and reasonable. Various courts have accepted challenges to the reliability of particular schedules and/or their underlying data. Delay Analysis. (Page 13) Michael T. Callahan (1991). To use CPM properly the underlying data must be accurate. If the input is introduced carelessly it will become an added burden to the job which hinders rather than helps. Construction Schedules. (Page 33) Michael T Callahan and H Murray Hohns).



which could not have been foreseen. The distinction may appear trite but will be an important factor when concurrent delays are considered.

Factors which ought to be considered when establishing the As-Achievable chart will include:

- adequacy of activity durations;
- relationship between activities<sup>12</sup>;
- the method of working;
- the type and complexity of the construction;
- resource requirements and availability;
- working conditions including weather<sup>13</sup>;
- site location and constraints;
- production, submission and approval of shop and working drawings;
- procurement, fabrication and delivery of materials and components;
- access dates and dates for owner supplied goods and services.

This list reflects good construction project planning practice and could no doubt be identified in the text of any one of a number of books on the

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<sup>12</sup> See for example Joseph E. Bennett Co., (Appeal) GSBICA 2362, 72-1 BCA ¶ 9364 (1972). An as-planned schedule may be found not reliable if the logic does not consider practical field restraints that control the construction sequence.

<sup>13</sup> See for example Titan Pacific Construction Corp. v. United States. 17 Ct. Cl. 630 (1989). The Claims Court refused to allow a contractor's as-planned schedule as a measure of delay because, among other things, the schedule did not provide for seasonal restraints for work in moisture sensitive soils during the wet season.

subject. Their relevance to the process of time analysis can be reinforced by consideration of general legal principles and decided cases<sup>14</sup>.

Other factors would include:

- the level of detail of the analysis to be undertaken;
- the peculiarities of any software used.

In order to evaluate the impact of individual delays on the date for completion it is necessary to consider the critical path through the project. It is therefore necessary to use a critical path network analysis. For convenience the use of a computer network planning system is preferable. The most widely understood and accepted form of presentation is the traditional bar chart.

It is important that the As-Achievable chart anticipates the level of as-built data available. It is of no use to create an As-Achievable chart with say 300 activities if it is only possible to provide as-built data for half of them.

### **3.8. The As-Built Critical Path**

An as built critical path network may form the basis of a time analysis.

Establishing the as built critical path may also be required as part of the proof of a delay claim. At first such an analysis would seem, at least in principle, an easy and obvious stage in any analysis.

The question is often posed; where is the critical path through the project? Again this would appear to be an obvious and important

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<sup>14</sup> See for example; *Pacific Construction. Co., Ltd v. Greater Vancouver Regional Hospital District*, [1986] 23 CLR 35 (B.C.S.Ct.). The British Columbian Supreme Court said in order to measure an impact claim with a schedule it would 'be necessary to evaluate the validity of the

question. A common response is 'well it's clear from looking at the programme'. This answer may be given even though the programme is a simple bar chart with no logic links or any critical path identified. On simple projects this may be possible. In practice the question is generally resolved in this way by what the courts would call a common sense approach. Common sense will often prevail. In fact the common sense approach is normally adequate to come to an agreement because both sides tend to take a common view and respect the practicalities of a particular case. This is evidenced by the fact the most time claims are compromised long before they are finally tested and resolved under the strict rules of evidence. It may seem perverse but the obvious may be extremely difficult to prove. There remains a question of how the as-built critical path can be proven.

The question may well, in due course, be lifted up into a practical one where the common sense approach does not prevail. This may occur either because the parties or their experts have failed to find a consensus or where the issues are large and complex. It is of course open to a defendant to make no positive defence and leave a plaintiff to prove its case. This is a gamble on the part of a defendant but may nevertheless be a situation which the practitioner could face. The Plaintiff will then need to prove what in the ordinary course is considered obvious.

### **3.9. As-Built Data**

One of the most important aspects of the time analysis is the ability to find a comprehensive set of as-built data. In order to make a valid comparison it is essential that the as-built data is compatible with the As-Achievable programme. This can only be achieved by ensuring that the As-Achievable chart anticipates the quality and comprehensiveness of as-built data available.

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contractor's original contract schedule and the "reasonable contractor schedule" before comparison to the actual performance'.



As a basic minimum, start and finish dates for each activity<sup>15</sup> are required. Sources of as-built data which have been identified in this research include:

- progress reports;
- site diaries;
- daywork sheets and other allocation sheets;
- plant and labour records;
- progress photographs;
- site meeting minutes;
- applications, valuations and other payments data;
- delivery records for materials, equipment or components;
- inspection and test reports including concrete tests;
- marked up programmes and or drawings.

The progress data should be presented in the same format as the As-Achievable chart. It is usual to produce a report, normally in the form of a bar chart, showing planned and actual activities side by side.

### 3.10. The Analysis

The analysis stage follows the preparation of the basic data set out above.

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<sup>15</sup> It may be desirable to concentrate on critical or near critical activities or parts of the project. This will be particularly useful on large complex projects.

Here the main objective is to explain the difference between planned and actual performance. A convenient aid to this analysis is a simple schedule which lists the planned and actual data for each activity and calculates the variance to the start, variance to finish and the increase or decrease in activity duration. Such a schedule will assist in identifying paths of delay.

This stage of the process will seek to explain each delayed or early start and finish and each duration change and show the overall effect on the project completion date. It is an established principle that delay should be measured as the impact on the project completion date not on the basis of a comparison of planned and actual dates for individual activities. When more than one cause contributes to or explains a particular change each cause should be noted.

At the end of this stage the analyst should have a narrative for each difference between the As-Achievable and the As-Built programmes. It should be possible to define either the adjustments in respect of each event which, if made to the As-Achievable programme, would produce the as-built completion date or, if made to the As-Built programme, would produce the As-Achievable completion date.

Thus far the analysis has been based upon entirely factual matters. No consideration ought to have been given to the matter of liability for the causes of delay. The allocation of liability should be considered as the final part of the analysis stage.

### **3.11. Presentation**

The method of presenting results must be capable of clearly demonstrating the impact of each cause of delay and the interaction of alternative or competing causes. Although the analysis may be based upon a computer network planning system the results will likely best be presented in bar chart form. The final presentation would either start with the As-Achievable programme and show the result of the introduction of

the adjustments in respect of each delaying event or with the As-Built programme and show the result of the removal of the delaying effect of each event.

Each delaying event should be documented to provide the following information:

- particulars of the term(s) of contract under which the allegation of delay is made, including details of any notice required and provided;
- explanation of the delaying event including relevant facts;
- start and finish dates of the delaying event;
- if the delaying event was contributed to by more than one party, details of each contribution;
- details of the work activities affected by the delaying event including identification number and description, start and finish dates and the duration;
- if the work activities were delayed by more than one delaying event, details of the contribution of each;
- overall impact of the delaying event on the project completion date.

These requirements are derived from the requirements identified in Section 2.4 above as adjusted by further consideration in formulating this Chapter.

The presentation chart(s) should be capable of showing which activities and delaying events are critical and the critical path through the project as a whole. The bar chart should be supported by a listing which identifies



the logical relationships between activities. The listing should identify the basis of the relationship.

### **3.12. Summary of Chapter 3**

Section 3.2 examined the general legal principles as related to the time for completion of construction contracts and the way in which they are incorporated in construction contracts. The provisions in the standard forms are reasonably clear and comprehensive. Provisions in sub-contracts are likely to be less certain.

Sections 3.3, 3.4 and 3.5 examined the way in which it may be anticipated that claims might arise.

Section 3.6 developed the principles of analysis which were identified in Chapter 2.

Sections 3.7, 3.8 and 3.9 considered the preparation of the various schedules required to demonstrate delay.

Sections 3.10 and 3.11 considered the basic requirements of the analysis and the presentation of the results.

Chapter 3 has developed and set out the theoretical concepts using the analysis of current literature and cases set out in Chapter 2 and general legal principles as a base. The theoretical concepts will form the basis of the comparison between theoretical concepts and current practice which will follow in Chapter 5.

## **Chapter 4 Current Practice**

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#### **4.1. Introduction**

Chapter 4 will review current practice against the headings set out in Chapter 3. There being an additional section in Chapter 4 the corresponding section numbers are one number higher in Chapter 4 than in Chapter 3. Thus section 3.2 in Chapter 3 will correspond with section 4.3 in Chapter 4.

The review of current practice will be based on:

- information from articles and decisions generally. A list of the Articles and decisions reviewed is set out in the Bibliography at Appendix 2 hereto.
- an analysis of a number of actual disputes. The disputes were selected from disputes upon which Northcrofts Management Services Ltd ('NMS') had been appointed over the past 10 years. A schedule setting out details of the disputes involving delay claims in respect of which NMS have been appointed is included in Appendix 3 hereto;
- the results of three recent published surveys of the construction industry one in the UK and two from Hong Kong;

The published surveys relating to the causes of construction claims are the work of Revay<sup>1</sup>, Kumaraswamy<sup>2</sup> and Kumaraswamy and Yogeswaran<sup>3</sup>.

Section 4.2 will describe typical examples of the disputes within the field study.

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<sup>1</sup> Revay S G, (1995) Can Construction Disputes be Avoided - Part II, Proceedings Construction Conflict: Management and Resolution.

<sup>2</sup> Kumaraswamy M M, (1997) Common Categories and Causes of Construction Claim, Article CLJ Vol 13 No 1.

<sup>3</sup> Kumaraswamy M M, Yogeswaran K, (1998) Significant Sources of Construction Claims, Article ICLR 15 January 1998.



Section 4.3 will consider how the general legal principles as related to the time for completion of construction contracts fare in practice.

Sections 4.4, 4.5 and 4.6 will examine the way in which claims arise in practice.

Section 4.7 will consider the methods of analysis actually encountered in practice.

Sections 4.8, 4.9 and 4.10 will consider the practical problems encountered in producing the various schedules which might be required to demonstrate delay.

Sections 4.11 and 4.12 will consider the form of analysis and presentation encountered in practice.

Section 4.13 will provide a summary of Chapter 4.

## **4.2. The Field Study**

The field study is based on disputes drawn from more than 100 construction related disputes which have occurred in the last 10 years. Time claims of one form or another were or are being prosecuted in more 50 of those disputes. The examples are considered to be typical of the major disputes involving delay claims. In most the claims were made on the basis of what could broadly be described as an As-Built analysis. The disputes were selected to meet the following criteria:

- formalised disputes ie those which are the subject of arbitration or litigation;
- disputes where the time for completion and the consequent financial claim represented a significant part of the subject matter in contention;

- that there were sufficient documents available to provide a meaningful comparison.

In respect of each of the disputes the process of analysis included reading and key documents and recording salient points. The key documents were:

- the pleadings;
- witness statements, where available;
- expert witness reports, where available;
- relevant project documents;
- delay analysis and presentation.

In each of the example disputes the parties were represented by leading firms of construction lawyers and/or leading members of the construction bar. The examples described below are considered to be typical of those currently reaching arbitration or action in the High Court. The examples selected were as follows:

- Developer v. Construction Manager;
- Owner v. Project Manager;
- The Society of Lloyds v. Kitson and Others;
- Developer v. Engineering Consultant;
- ICI v. Bovis and Others;
- Sub Contractor v. Contractor;

- Package Contractor v. Construction Manager.
- Design and Construct Contractor v. Owner.
- Design and Manage Contractor and Others v. Owner.
- Sub Contractor v. Contractor.
- Sub Contractor v. Contractor.
- Design and Build Contractor v. Owner.

The first 10 of these disputes have all been resolved by a negotiated settlement. The last two are still running.

The records in respect of each were reviewed. Notes were taken in respect of:

- the nature of the dispute;
- the way in which the delay claim was made and supported;
- particular features and problems, and in particular problems:
  - (i) which may be (the) cause(s) of delay and contribute to the need to produce an analysis;
  - (ii) that the analyst must recognise may affect his choice of analysis method; and
  - (iii) which the method of analysis must be capable of accommodating.

These notes were then



#### 4.2.1. Dispute (a)

Delay and additional cost arose during the construction of a shopping centre situated in the centre of Bristol. Construction started on 27 January 1988 and the construction period was 30 months giving a completion date of 26 July, 1990. In the event the construction manager was removed from site on 8 April, 1991 and the work was finally completed on 31 July, 1991 some 65 weeks late. The original estimate of cost was £40.9m and the final cost £79.9m. Allowing for scope changes of £15.8m the cost overrun was £23.2m including loss and expense claims of package contractors.

Loss and expense claims from package contractors were settled by the Construction Manager by negotiation rather through any formal analysis. The employer sought to recover some of its losses from the Construction Manager. None of the claims or the settlements were based on formal delay analysis. After preliminary exchanges through an ADR procedure a writ was issued in the High Court at the end of 1993. The overall amount claimed against the construction manager was £102.8m. The points of claim presented the time claims in purely narrative form. The allegations were derived from an As-Built analysis measured against a network constructed to reflect the original bar chart. The original bar chart had about 60 activities and the network constructed from it had about 250.

There were requests for further and better particulars in respect of the claim. These were answered largely in narrative form but a draft of part of the expert report was also volunteered. The draft report included an As-Built analysis. In the event the claim was compromised on favourable terms in March, 1996 before the formal exchange of expert reports.

There had been a limited number of meetings between the experts and there was little consensus regarding the proper approach to analysis. The Respondent's expert was proposing to use what might be described as an

‘ultimately critical’ approach. This approach was largely based on seeking to establish when construction information was provided by the design consultants. The approach failed to consider the fact that the designers would have adjusted their information release programme to reflect delays in construction work. There was no consensus about as-built dates. The Respondent’s expert had adopted a network programme produced late in the project which had not been completed. The network contained about 3,000 activities and in respect of those activities a database, containing some 35,000 data entries related to as-built dates, had been assembled. Having assembled this data the Respondent’s expert appeared to be unable find any way of putting it to use.

#### 4.2.2. Dispute (b)

Delay and additional cost arose during the construction of a new exhibition hall. The original contract sum was £29,530,500 and the final cost £45,250,00. The original commencement date was in June 1987 with completion in December 1988. In the event completion was achieved on 31 May, 1989. The contractor had been awarded an extension of time up to 22 March, 1989 by the Architect.

The contractor commenced arbitration proceedings claiming an extension of time and loss and expense for delay and disruption. The contractor presented his time claims on the basis of an As-Built programme. This programme showed by means of different colours, for each activity, delay to commencement, extended duration and delay to completion. The presentation did not represent a critical path through the job or any logic links. The time claims were in fact made in narrative form by way of a detailed description for each activity. This description gave details of events which allegedly explained actual performance. The descriptive narrative fell short of a complete explanation and failed to demonstrate cause and effect. There was a request for further and better particulars of the delay claims. Before service of such particulars the matter was settled



by agreement. It appears however that the contractor had acknowledged that substantial further work was required to particularise the delay and had instructed an expert to prepare further analysis. This further analysis was never completed but was to have proceeded on the basis of a networked version of the original plan. The expert had done a great deal of work trying to relate the various instructions and late information to the appropriate network activities.

Following settlement of the contractors loss and expense claim the employer commenced proceedings in September 1992 against the Project Controller and Quantity Surveyor in an attempt to recover some part of those losses. The statement of case against the Project Controller was issued early in 1993. The allegations in respect of delay were set out in the Points of Claim in narrative form. There was a request for further and better particulars of the delay claims. Further particulars were given in a schedule but mainly in narrative form. These particulars were considered inadequate by the Defendants who sought to have such claims struck out for want of particularity. The striking out application did not succeed, however further analysis along the line started by the contractors expert was required. Advice was that it may be necessary for the Claimant in this action to prove the claims which were compromised with the contractor and effectively have the arbitration which was avoided by that compromise.

An expert report was produced which contained an As-Built presentation using PowerProject software. The software was used mainly as a drafting tool although the activities were properly networked and the critical path was shown. The Defendant's expert did not deal with the time claims and the Plaintiff's expert evidence went unchallenged. The matter was compromised in January, 1995 before the Judge was able to consider the delay claims.



#### 4.2.3. Dispute (c)

See also the comments of the reported decision in Chapter 2<sup>4</sup>.

The construction contract was for the refurbishment of a headquarters building in the City of London. The original contract Sum was £13,668,000 and the final contract value was £18,588,269 and increase of £4,920,269. The commencement date was 14 September, 1987. The original date for completion was 4 January, 1989 and actual completion was achieved on 21 December, 1990. The contractor had received an extension of time up to 6 January, 1990.

The contractor had commenced arbitration but had not served Points of Claim. The contractor had undertaken what turned out to be an impossible analysis of project data including Architects Instruction, Site Instructions and Query Sheets, Drawing Issues and Revision etc. This data had been substantially logged in database form with the various entries allocated to programme activities and site locations. Whilst this appeared to be a good set of basic data the contractor, advised by a leading firm of construction lawyers, had no apparent plan for turning this data into a meaningful delay analysis.

The contractor settled its claims on 6 March, 1992. The total value of claims was £21,179,621 and the contractor settled for £4,920,269. Having settled the contractors claims and inherited the analysis it was sought to complete the task started by the contractor for use as the basis of claims against the asbestos removal specialist and the design consultants. The problem with the data really amounted to the fact that it had been gathered without any real consideration being given to sifting the instructions which had some real and significant impact from those which did not. In short a qualitative selection process was required. The

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<sup>4</sup> The Society of Lloyds v. Kitsons Environmental Services and Others. (QBD 1994) Unreported. (The Others were more particularly the architect DEGW, the list of defendants included each partner, and the engineer Oscar Faber).

architectural and engineering experts retained were unable to make much headway in this regard.

In the event a writ was issued and Points of Claim were served on the consultants in 1992. Although a substantial amount of work had been done in analysing the original plan and the causes of delay by computer network, the allegations in respect of delay were set out in the Points of Claim in narrative form. There was a request for further and better particulars of the delay claims. Extensive further particulars were given in a Scott schedule mainly in narrative form but with detailed cross reference to specific activities and actual site performance. An attempt was made to indicate the critical path through the project and to resolve the matter of concurrent causes. These particulars were considered inadequate by the Defendants who sought to have such claims struck out for want of particularity. The striking out application did not succeed. Again advice was that it may be necessary for the Claimant in this action to prove the claims which were compromised with the contractor and effectively have the arbitration which was avoided by that compromise.

In the event the matter was compromised before the exchange of expert reports.

#### 4.2.4. Dispute (d)

The original contract start date was 5 January, 1987 and completion should have been on or before 31 October, 1988. Practical completion was achieved on 26 June, 1989 the contractor had an extension of time up to 13 March, 1989. The original contract sum was £30,672,743 and the final contract value was £44,500,000.

There was a claim against the engineer for alleged negligence in respect structural and services work. The total value of the claim was £18,600,000. It was alleged that the negligence of the consultant led to delay disruption and capital costs. The delay claims related to two



specific periods one at the commencement of the project and the other right at the end. Both proceed on the As-Built basis. The early delays were set out in narrative form but were said to be demonstrated on an As-Built bar chart. The accompanying bar chart showed planned activities, actual durations and some crude logic. There was a poor descriptive attempt to support the original plan. Concurrent causes were not adequately addressed. There were a number of requests for further and better particulars and the Points of Claim were amended and re-amended. An eight week hearing set to commence in June 1994 had to be abandoned because the Claimant was not ready to proceed with its case. The delay to completion, said to be due to a single act of negligence, was put on a 'But For' basis. There was no analysis but the statement that had it not been for this one event then completion would have been 11 weeks earlier. The claim and defence both relied, substantially, on what happened in fact. The defence asserted that, for reasons unrelated to the Respondents alleged negligence, the project completion would have been delayed in any event.

In the event the matter was compromised before the exchange of expert reports.

#### 4.2.5. Dispute (e)

See also the comments of the reported decision in Chapter 2<sup>5</sup>.

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<sup>5</sup> ICI v. Bovis Supra. Although the claims were never actually struck out the Plaintiff was effectively forced to settle the matter because the time claims were, despite numerous attempts at further particularisation, incapable of being resolved on the basis which had been adopted. The Plaintiff had attempted to make separate allegations in respect of each and every late piece of information. ICI had an impossible task when it tried to allocate the losses to each allegation. In the event this led to the delightful but absurd allegation that the late issue of information for an alarm bell caused a loss of some £750,000. There were extensive schedules which listed every drawing revision and other instruction giving the date of issue, the date when the information ought to have been issued and calculating a delay on that basis. Having provided this level of detail ICI were unable to relate this to the delays suffered on the project. This was a classic case of information overload. Having identified the lowest level of design information issue which was potentially delay (or disruption) causing to the contractor it became impossible to allocate any specific loss. Such a dis-aggregation of potentially delaying influences is self defeating. Taken in isolation any individual piece of design information is unlikely to cause delay.



The construction management contract had an Estimated Prime Cost of £29,052,000 and the final contract sum was £52,358,479. The original start date was 30 September, 1985 and completion was achieved 61 weeks later than planned on 30 September, 1988.

The claim against the designers was presented in Scott schedule format. This schedule listed all the drawings and other instructions which had allegedly been provided late. This schedule contained details of the date when each piece of information ought to have been provided, the date when it was provided and calculated the delay as being between the two dates. The judge found that these schedules did not provide adequate evidence of default on the part of the designers. The judge did not dismiss the claim but ordered that better particulars should be given. The order did not specify the form of such particulars which may have been satisfactory. In the event the burden of the additional work required of the plaintiff forced it to settle at a fraction of the claimed sum.

#### 4.2.6. Dispute (f)

The claim was in respect of a sub-contract for demolition work. The original order value was £115,000 and the programme for completion of the work was between 1 January and 20 April 1987. The sub-contractors employment was determined on 18 March, 1987.

The sub-contractors employment had been determined on the basis that he was not performing as required under the sub contract. The sub-contractors employment had been determined after about three weeks. The sub-contractor claimed for work done and loss of profit, the contractor cross claimed the cost of completing the work using direct labour. Both sides had pleaded their case in entirely narrative form. In the event the contractors cross claim failed for four main reasons:

- the contractor had failed to give adequate notice of termination;

- the contractor had used the wrong programme to measure the sub-contractors performance. The programme used was more onerous than the sub contract programme;
- the sub-contractor was, despite of the short period of actual performance, entitled to some extension of time;
- the intermediate dates used to determine the rate of progress could not, on advice, be relied upon.

The matter was settled on terms favourable to the sub-contractor.

#### 4.2.7. Dispute (g)

The sub-contract was for piling work and the contract sum was £3,308,497. The commencement date was 20 January, 1989 and the period for completion was 26 weeks. In the event the sub-contract works were completed about 2 weeks late. However individual piles or groups of piles were up to 8 weeks late. This was due to the need to carry out extensive remedial work to many of the piles.

The piling sub-contractor made a claim of £681,459 for mainly disruption costs. The management contractor cross claimed delay, disruption and acceleration cost caused by the need to carry out extensive remedial work to piles totalling £2,268,133.

In making the cross claim the management contractor relied upon contemporaneous assertions about the impact of remedial work on subsequent trades and completion as a whole. The Plaintiff sought further and better particulars of alleged delay caused by remedial work. At this stage a number of difficulties were identified in the Defendants case:

- the programme for the Plaintiffs work and in particular the sequence upon which the Defendant needed to rely was not obtained from the tender or contract programme;
- the programme for subsequent trades which the Defendant alleged was based upon the programme relied on above allowed for the impact of other delays;
- there was a gap in the as-built data which potentially broke the chain of causation. The impact on subsequent trades ought to have been measured through the performance of pile caps and the ground floor slabs, however data in respect of slabs was not available.

Particulars were provided which sought to avoid these issues.

In the event the matter was settled on terms favourable to the sub-contractor.

#### 4.2.8. Dispute (h)

The claim was in connection with a turnkey contract to construct a Gas Fired Combined Cycle Power Station. The sterling part of the contract sum was £96,070,102 a further £30,000,000 was also to be paid in French Francs and Deutchemarks. The commencement date for construction work was 14 April, 1991 and the plant was to be complete and producing power by 30 August, 1993. In the event the Taking Over Certificate was not issued until 22 February, 1994.

The contractor claimed £4,110,376 as damages and the repayment of £20,252,239 withheld by way of liquidated damages. There was a counterclaim of £24,726,459 mainly as a result of losses suffered by the Employer under the extremely complex agreement for the sale of generated electricity to the National Grid.



The Plaintiff made a composite delay claim. It claimed an entitlement based on a prospective analysis for a delay which was caused by an early design change and a delay to completion caused by changes to and during the commissioning of the project on the basis of an As-Built analysis.

The claim for delay to commissioning which covered approximately the last four months of the project was pursued on an entirely descriptive basis. The Plaintiff was asked to particularise its case by way of formal analysis but this it failed to do. The matter settled in January 1997 before expert reports were exchanged.

#### 4.2.9. Dispute (i)

The claims arose out of a construction contract to build and equip a waste paper recycling plant. The original estimated contract value was £39,608,200. In the event the final cost was in the order of £44,000,000. The start of construction work was in mid May, 1994 and completion should have been within 15 months, giving a completion date of 23 August, 1995. In the event the plant was completed at the beginning of November 1995.

The construction managers sued for outstanding fees and the employer counter-claimed for excess costs incurred on the project. Two third parties were involved in the action, the pipework installation sub-contractor and the pipe supplier.

The original claim for fees was £182,219. The counterclaim was for approximately £4,500,000 (Approximately because even at January 1998 with the hearing due to start in February 1998 it had still not been possible to resolve the actual value of the counterclaim). The piping sub-contractors claim was for the cost of accelerative measures and variations amounting to £1,160,271 and the supplier was suing for the price of the pipe supplied of £758,156.

There had been delays to the pipework contractor due to the late receipt of information for construction and the late supply of materials. The employer had refused to pay the construction manager, the sub-contractor and the supplier.

The employer alleged that the construction manager had been late in ordering the materials and/or providing information, had failed to manage the works properly and in particular the progressing of material supply, the management and control of the budget and planning the work.

In the event the employer had effectively pleaded a delay claim against the construction manager which had no evidential support whatsoever. The employer had sought a deferral of the trial date but this was refused. Although expert evidence was being produced it was too late to attempt any form of delay analysis.

The matter was settled by agreement between the parties in January 1998. The construction manager paid the employer £100,000 the pipe supplier was paid nothing, thus, effectively contributing over £700,000 to the settlement and the pipework sub-contractor was paid £500,000.

#### 4.2.10. Dispute (i)

The claim related to the construction of four chimney liners of a power station. The original contract sum was £340,000 and the claim was for the payment of an additional sum of £1,174,830. The sub-contract was due to commence on 20 June, 1995 and complete by 10 November, 1995. In the event the works were not completed until 21 March, 1996.

The sub-contractor contended that the additional cost and the delay were caused by a change in the welding specification. The change in welding specification meant that the volume of work increased dramatically and that this in turn led to the need to change the construction method. The contractor said that both the original tender and the programme were too

optimistic and that the sub-contractor would always have had to have used the construction method actually adopted.

The sub-contractor sought to sustain its case on delay on the basis that it was not bound by any particular completion dates and that it had the flexibility to commence earlier than the date in the contract and that completion in March 1996 had not caused any delay to the works as a whole. Thus the dispute had proceeded without any form of delay analysis. When such an analysis was belatedly attempted it was clear that the original contract period was insufficient.

Notwithstanding such serious weaknesses the sub-contractor managed to achieve a settlement in February 1998 on the 'Court steps' of almost half the sum claimed plus costs.

#### **4.2.11. Dispute (k)**

The sub-contract works are for the erection of air cooled condensers and water cooler plant of a Gas Fired Power Station. The contract sum was £696,000. The total value of the final account, as claimed, is £2,236,898 of which £1,044,435 has already been paid. The original start date was 1 September, 1995. The original date for completion was 5 April, 1996 and in the event the work was not completed until 26 July, 1996.

Initial pleadings have been served and it is anticipated that there will be a hearing of the matter towards the end of 1998.

The sub-contractor has been advised by counsel to put its main claim for loss on the basis of instructions to accelerate rather than to seek an extension of time. Thus there is currently no delay analysis presented by either party.



#### 4.2.12. Dispute (I)

The claim arises out of a construction contract for the construction of two new office buildings and two new residential units. The contract incorporated the Contractor's Designed Portion Supplement and was heavily amended. The contract sum was £14,777,993. The date for commencement was 7 June, 1993 and overall completion was 28 March 1995. In the event practical completion was 27 November, 1995 a delay of 35 weeks. The contractor is claiming £8,649,027 plus VAT.

The contractor has served its statement of case and the employers reply was served in mid April 1998.

The delay claim is supported by a series of As-Built charts upon which both planned and actual bar are shown together with details of the delaying events. There are 10 such charts dealing with three separate parts of the work each split into a number of time windows. The charts attempt to identify 72 separate causes of delay. The resulting charts are extremely confusing and difficult to follow.

The charts include a comparison between the planned and actual dates for each activity. The planned bars are based on a separate analysis of the original programme which has been carried out using HORNET software. The original programme was hand drawn and did not show the critical path. There are a number of deficiencies with the reconstruction of the original programme which are likely to undermine the whole analysis. In particular the HORNET network seeks to introduce constraints which were not apparent in the original programme.

The As-Built charts have been 'drawn' using the PowerProject software. It is clear that the charts are 'drawn' rather than being a proper network analysis because the link lines are not vertical as they would be if the data had been analysed.

There is therefore no attempt to identify the actual critical path and thus whether any particular delay actually caused a delay to completion is a matter of speculation.

It is considered that a significant amount of distillation and clarification of the Claimant's analysis will be required before the time claim can be tried by the Arbitrator.

#### **4.2.13. Other Decided Disputes**

In **Wharf**, a decision which has probably influenced most recent time related claims, no formal analysis of delay had been undertaken. Apparently the employer simply said I have had to pay the various contractors claims for loss and expense, I believe you the architect are responsible for the delays which gave rise to these losses with no further analysis of the delays whatsoever.

See above in respect **ICI v. Bovis**. The judge did not dismiss the claim but ordered that better particulars should be given. The order did not specify the form of such particulars which may have been satisfactory. In the event the burden of the additional work required of the plaintiff forced it to settle at a fraction of the claimed sum. Being an out of court settlement the full details were not made public. The original claim was in the order of £50 million and the settlement was, it is thought, under £5 million.

The problems identified in the **ICI** decision reinforce the need to provide proper particularisation of delay claims. However, given the poor quality of the claims particularisation in both **Wharf** and **ICI** it is difficult to understand the concern.

#### 4.3. The Construction Contract and the Time for Completion

Contracting parties seek to, and to a large extent do, include clear provisions in respect of the time for performance in construction contracts. The contractual provisions regulate the performance of the parties and provide sanctions where either party fails to perform. The standard forms provide for the insertion of commencement and completion dates. Sectional completion or partial possession may also be required. Contractual provisions also, as a matter of practicality, acknowledge that delays may occur. These provisions ensure that when such delays occur the completion date can, if necessary, be adjusted. The provisions also provide for the recovery of loss and/or expense by the contractor and deduction of liquidated damages by the employer in appropriate circumstances. Without provisions to adjust the completion date as a result of default by the employer, the employer would lose the right to deduct liquidated damages. It is possible that the agreement may provide a bonus to be paid to the contractor in the event of early completion.

There are also provisions requiring the contractor to progress the work. A typical requirement is that the contractor should proceed regularly and diligently with the work. Exactly what this means is not, however, entirely clear<sup>6</sup>.

In practice the actual provisions often fall short of the intended certainty. The use of standard forms, particularly for main contracts, tends to reduce uncertainty. However heavily amended standard forms or tailor made contracts, particularly for sub-contracts, do cause problems. Parties are often surprised when disputes arise and delays occur in respect of matters which they believed had been adequately addressed. This may be

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<sup>6</sup> Powell-Smith Vincent, (1992) The Pursuit of Progress, Article Contract Journal, December, 1992.



because the provisions are unclear, inadequate or drafted to favour one party.

#### 4.4. Claims by Employers Against Contractors

An employer new to construction may be reassured by the apparent safeguards within the contract documents against the completion of his project being delayed. If put simply it would be that there is a completion date which, unless the employer varies or increases the scope of the work or certain fairly remote things happen, is fixed and that if the contractor fails to complete by that date he will have to pay the employer damages either at a pre-determined rate or based upon actual losses. In practice the terms of construction contracts do offer that possibility and many projects do in fact finish on time.

Construction projects are usually lengthy undertakings and employers often find that work is falling behind programme at quite an early stage. An employer can do little if his contractor is failing to perform as expected. Where the contractor fails to perform at all then there are terms which provide for the removal and replacement of the defaulting contractor. But many employers have discovered, to their cost, just how dire the contractors performance must be before such a removal is justified. Anything short of a virtual standstill by the contractor may be insufficient grounds for termination<sup>7</sup>.

Employers often feel that the failure to perform is self evident and that, for example, the contractor is not performing at a rate that will enable him to complete on time. There are several, potential, confounding factors to this simple thesis:

- the contractor will deny there is any delay. There is often a difference of opinion about whether the work is on programme or in delay.

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<sup>7</sup> See in particular Chapter 2 in respect of *West Faulkner Associates v. London Borough of Newham* [1994] 71 BLR 1.

Construction programmes produced and progress records kept often do not provide adequate information to determine such matters with any degree of accuracy;

- if there is agreement about the state of progress the contractor will be adamant that the lost time will be recovered, alternatively;
- the contractor will argue that he is entitled to an extension of the completion date equivalent to or greater than the amount of delay actually incurred.

It is notoriously difficult to obtain a consensus view from contractor and consultants.

The employer is unlikely to have any redress in respect of losses caused by intermediate delays which do not delay overall completion unless there are provisions for sectional completion. On a city centre redevelopment there was a substantial claim against the piling sub-contractor<sup>8</sup>. A significant number of piles had failed. It was found that when the pile heads were exposed it was necessary to remove up to 4m from the top of some piles before sound concrete could be found. There was a dispute about the cause of the defective concrete but the sub-contractor had repaired the piles as the work proceeded and in the event overall completion of the piling was more or less on time. In the meantime however serious disruption had been suffered by following trades. The contractor had broken the site into five phases and each of those phases was broken down in to about eight sections there being some 40 sections in all. Each of the 40 sections were shown separately on the piling package programme and on the programmes of other package contractors. The programme was not, however, incorporated in to the package contract and was, on the advice of counsel, found to be

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<sup>8</sup> GKN v Bovis Supra.

unenforceable. In the event the contractor was unable to succeed in his claim based upon delay to individual section completion dates.

Although the provisions relating to the completion date are generally clear, when a contractor is in default by failing to meet the completion date of the project (or a section if there are provisions relating to sectional completion), the ability to deduct damages is often confounded because the cause of the delay has not been determined. It is usual that the terms of the contract prevent any deduction until the employers representative has determined any outstanding application for extension of time. Consequently damages are not always deducted and are more likely to be offset in settling the contractors account.

Employers do not need to produce an analysis to prove that the contractor is in delay. Assuming that there is a contractual date for completion, original or extended, failure to meet that date and in the absence of any outstanding application for extension the contractor is in default. The employers role is therefore passive and at worst defensive. Where damages are unliquidated the employer will have to prove his actual financial loss.

There is a tendency, however, for this general principle to be overturned where a contractor has commenced formal proceedings and made a poorly defined time claim. Advice of counsel will likely be that the employer, in his defence, should provide as full a rebuttal as possible to the contractors allegations. Such an approach may involve the party seeking to defend the claim in significant expenditure of both time and money.

#### **4.5. Contractors and Sub-Contractors Claims**

There are a wide range of provisions available to a contractor seeking an extension of time.



The types of occurrence anticipated in most of the commonly used standard forms fall into three main groups:

- shared risks. These give rise to extension of time, but no money (excusable non-compensable delay);
- risks accepted by and fault on the part of the employer<sup>9</sup>. Delays give rise to extension of time and money (excusable compensable delay);
- risks accepted by and fault on the part of the contractor. There is no entitlement to either time or money (non-excusable non-compensable delay).

The first group includes the matters which are directly referred to in the contractual provisions or terms dealing with extension of time and those dealing with loss and expense and any other acts of the employer which could cause delay.

The second group are matters which are identified in the provisions dealing with extension of time but not found in the loss and expense provisions. This group is limited to those particular matters set out in the contract.

The third group is of any other matters which are not referred to in the contract and are not matters for which the employer can be held responsible. Whilst there is no reference to the occurrence of such matters in the contract they are anticipated to the extent that any delay on the part of the contractor will give the employer the right to recover damages.

The contractual terms will include the express terms and any other terms which may be implied. Discussion of the bases upon which terms may be

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<sup>9</sup> These risks include the risk of failure to perform by consultants employed to discharge his contractual obligations.

implied is beyond the scope of this work. Examples<sup>10</sup> of the type of terms which might be implied include:

- that the employer would not hinder or prevent the contractor from carrying out its obligations in accordance with the terms of the contract and from executing the work in a regular and orderly manner;
- that the architect would provide correct information;
- that the architect would administer the contract in an efficient and proper manner.

#### **4.5.1. Excusable Compensable Delay**

These are matters which are within the control of the employer or contractor in the case of a sub-contract. In seeking to bring his claim within one of these causes the contractor will have to show how the employer, or those acting for him, ought to have performed, by reference to particular terms, how the employer actually performed in fact and demonstrate the impact. When considering the impact it is important to look at the overall impact on the project completion date. In practice most analyses fail to make this link.

Most of the standard forms provide that the following matters give rise to excusable compensable delay:

- instructions for additional or varied work including instructions relating to the expenditure of provisional sums and correction of errors in quantity;
- late provision of information;

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<sup>10</sup> See for example *London Borough of Merton v. Stanley Hugh Leach Ltd.* (CD 1985) 32 BLR 51.

- delay on the part of artists and tradesmen executing work not forming part of the contract;
- late supply of employer provided plant, materials or equipment;
- instructions regarding postponement of the works;
- failure of the employer to give access;

The first and fifth items flow from the exercise by the employer of a right to make such instructions, the other matters are a breach of a duty to perform in a particular way.

#### **4.5.1.1. Additional or Varied Work**

Leaving aside the question of timing, the need to carry out an increased volume of work may require additional time. Contractors will generally allege that this is the case. The need for additional time will, however, depend on several things:

- Whether the work is on the critical path. If not a delay may not affect the project completion date;
- Whether additional resources can be used to allow the additional quantity of work to be carried out in the same amount of time;
- Whether the sequence or the method of construction can be altered to maintain the original completion date.

If not determined and demonstrated at the time the variation occurred the question of criticality is a matter for analysis. It is possible that any delay which did arise could have been avoided. Whether additional resources or changes in sequence and method were considered or implemented are again matters of fact.



Leaving aside the question of timing, varied work may require additional time. Similar prospects for avoiding delay as set out in respect of additional work apply. A particular feature of varied work is that original work may have already been installed. Consideration should therefore be given to the time required for the removal of original work.

With additional or varied work consideration should, if appropriate, be given to the time required to carry out design and preparatory work and the time required to obtain additional materials, plant and/or labour resources.

Where delay is avoided by increasing resources or changing the sequence or method of construction, an alternative claim in respect of additional costs may well, subject to proper notice, be valid. In examining a time claim the analyst should enquire whether such alternatives were considered and what comparisons, if any, were made.

Claims are, on occasions, presented on a pro-rata basis using either cost or volume. Pro-rata calculations based upon value may be particularly misleading. Value can increase or decrease dramatically with little or no impact on the work content. Such an approach may be appropriate for some simple operations. It would not, however, be an acceptable basis for the calculation of the time required for a complex activity or for a project comprising several diverse operations. Nevertheless if the analysis is, for example, concerned with an increase in the volume of excavation it must be true, all other things being equal, that the increase in time required for the activity will be in direct proportion to the increase in volume. Such a calculation can, therefore, be seen to reflect the calculation of a new duration being determined by multiplying the quantity of work to be achieved by an appropriate constant. Before adopting a pro-rata approach the analyst should be satisfied about the composition of the element to be so adjusted and the validity of the original allowance.

Whilst the calculations required to prove work content claims are simple, and maybe because they are, they seldom feature in large disputes. Where there is a dispute it is more likely to be about liability for the increase rather than about the extent of any additional time requirement.

The constituent parts of delay caused by additional work and variations that require additional work are likely to include:

- an increase in the volume of work to be executed;
- prevention, awaiting materials, plant and/or labour resources.

#### **4.5.1.2. Late Provision of Information**

In modern construction significant parts of the work are carried out by specialists. There is a need for designers to provide information to the contractor and also a need for the contractor or his specialists to provide information to the designers. Particularly with services installations the selection, within defined parameters, of major pieces of plant and equipment is left to the specialist. The type of information likely to be required includes:

- basic construction information in the form of drawings and schedules either to complete the original intent or incorporate varied or additional work;
- instructions for changes, additional work and the clarification of errors, omissions, and queries;
- instructions for the nomination of sub-contractors or suppliers;
- comments on or approval of contractors design and other proposals, either in respect of permanent or temporary works.

Where a nominated sub-contractor or supplier has become insolvent the architect may be responsible for nominating an alternative.

The field study has identified that, regardless of what might be said to the contrary, even the simplest of construction projects are often not fully designed before work starts on site. This may be intentional in that there is a tendency towards a requirement for specialist contractors to design elements of the work. With increasing pressure on fees designers are also anxious to reduce their own workload wherever possible. There is also a trend towards the use of design and build forms of contract.

Failure to acknowledge this prevents proper consideration of information flow and the attendant problems of managing it. Similarly there is little consideration given to the interaction and timing of the production and publication of this information. Consequently difficulties often arise with both the process and timing of information flow. It is not unusual to find that information which is urgently required is not available either because its need was not anticipated at all or because, although anticipated, will not be available for some time because the information has not been prioritised.

A contractor working with unfamiliar contractual provisions as a result of different forms of contracting, such as construction management, or working in unfamiliar markets may lead to confusion regarding the responsibility for the provision of design information.

To avoid confusion and potential delay it is necessary to define what information is required, who is to provide it and when. It is argued by many leading managers that a fully co-ordinated programme is required which details all design and construction activities. Such close coordination between design and construction activities is rarely seen in practice.



Information release schedules are often prepared. They are frequently prepared before an agreement is concluded and referred to and/or incorporated therein. Such documents, however, do not create a binding obligation to provide the information on or before the specified dates. Disputes arise as to the status of such documents and failure to meet dates contained in them will not be taken, *prima facie*, as being proof of a delay. See for example **London Borough of Merton v. Stanley Hugh Leach Ltd.**<sup>11</sup>. A contractor seeking more time must prove that the late receipt of that information actually caused delay.

Where significant parts of the work are carried out by specialists there is a need for designers to provide information to the contractor and also a need for the contractor or his specialists to provide information to the designers. Designers require information from the specialist for their approval and to inform their own design.

An example of such a problem occurred on a large project in the middle east. The contractor decided to use the engineer's outline scheme drawings for the installation of air conditioning and plumbing services rather than produce his own working drawings. Despite protests from the engineer and the employer the contractor persisted and did not produce his own drawings. The result was that there were clashes between the various services and ductwork, once fabricated, would not fit. Additional work was required and this caused delay. In this particular dispute the contractor was from the US and the consultants and the employers own staff were from the UK. Each being used to different working methods.

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<sup>11</sup> **London Borough of Merton v. Stanley Hugh Leach Ltd.** (CD 1985) 32 BLR 51. It was held that the contractors programme, provided at the beginning of the project, was a specific application for instructions, drawings, details or levels as required by the contract and was therefore good notice. It is necessary however to consider each item of information applied for by that means on its merits. The Judge considered the question of whether the application '*was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for [Leach] to receive the same*'. It was decided that the date referred to was the date upon which the information was required and not the date of the request. Any such request may, however, have to be revised to allow for any delays and other changes which might occur in fact. See also **Glenlion Construction Ltd v. The Guinness Trust.** (QBD 1987) 39 BLR 89 which in turn refers to the following passage "*Thus in the Neodox case it was said that what is reasonable includes the point of view of the engineer and his staff and the employer*".

A typical example of both a lack of information from a specialist and failure of the process is often seen in the provision, for example, of details of builders work in connection with services. Information regarding the size and location of holes for cables pipes and/or ducts, plinths for plant and equipment etc, service ducts and risers and plant housings and enclosures is not produced until after preparation of services installation drawings. On several projects a common theme has been found to run thus:

- the specialist does not have the details he requires for, by way of example, supporting steelwork to a piece of plant;
- the engineer, in response to a request for details of the steel, says either:
  - that the detail is the responsibility of the specialist; or
  - that he cannot produce the detail because the specialist has not provided details of the weight, size, mounting details, etc. of the plant;
- an argument ensues and the information is produced late.

An old 'merry go round' of an argument. Sharp practice by the engineer, maybe, default by the specialist, possibly, delay and extra cost for the employer, certainly. Such disputes, more frequently encountered than many would admit, are not easily resolved.

The need for additional information may arise during the contract. The introduction of additional and varied work has been discussed above. Queries also arise which require answers which themselves add to or vary the work. Such queries arise because construction information is either conflicting, incomplete or inadequate.

The adequacy of construction information is often a cause of complaint. Contractors often complain about the adequacy of the information provided. It is not always clear whether such concern is real, imagined or contrived. There is no doubt that a contractor who cannot get on because of problems of his own making may be anxious to put the blame for delay at the door of the designer. Where there are disputes about the adequacy of information they are not easily resolved. Where the adequacy is in question this will result in there being a delay whilst the deficiency in the information is made good. Productivity may also be reduced because of the need to frequently refer queries for clarification. Clearly the analyst ought to seek to determine whether such complaints were, in the event, justified.

On one very large project the architect intended to produce all his working information on 1:100 floor plans. In the event the client was not happy with this arrangement and the architect was required to produce the information on 1:50 plans. Some delay was caused to the design process whilst this information was made available. The drawings were, in the event, badly co-ordinated. Subsequently the contractor alleged that the design information was inadequate in many detail respects and raised a very large number of queries. There were continuing arguments as to whether the queries and the answers provided were necessary and whether the answers amounted to variations. Clearly where such clarifications require additional work the delay is likely to be twofold. The employer eventually commissioned a team to check the drawn information to determine its adequacy. This team raised numerous queries of their own. Nevertheless after the expenditure of considerable effort the results were inconclusive. In the event the contractors claims were compromised. On any view the design information was not sufficiently comprehensive to avoid the contractor being able to maintain an arguable claim.



If any of the original information or additional information is provided at a time which causes delay to the project, adjustment of the completion date will be necessary.

#### **4.5.1.3. Delay on the Part of Artists and Tradesmen**

This description covers work carried out by the clients directly employed labour or contractors on the site. These are described as 'other contractors'. There are separate provisions relating delays caused by the statutory undertakings whilst carrying out their statutory obligations in connection with the Works.

If the employer separately appoints other contractors to carry out work in connection with the project he will be responsible for any delay caused by those other contractors. It will be difficult for the employer to recover losses suffered through the main contract from the other contractors unless there are express provisions in the separate contract covering such losses. The reverse is also true and the standard forms do not provide the employer with a remedy. In a recent dispute where the employer sought to invoke implied terms of non-interference by the other contractor the action was compromised on strong advice that such a term could not be implied. The type of problem caused by such a contractor will depend upon the work he is carrying out.

Where the main contractor's work is dependant on the completion of the other contractors work and the other contractor's work is completed late delay will arise. Where there is no particular part of the main contract work which is so dependant and the main contractor merely has to provide access delay may nevertheless occur due to disruption or disturbance of the main contract work by the poor performance of the other contractors. A similar situation potentially exists on construction management contracts. There each works or package contractor is in direct contract with the employer. These individual contracts normally

allow for cross charging of losses caused by one package to another. Nevertheless the employer is required to act as banker while the cause of the delay is established and is, in any event, left holding any residual losses.

#### **4.5.1.4. Late Supply of Employer Provided Plant, Materials or Equipment**

It is not very common, in general contracting, for the employer to provide such items. This does, however, happen more frequently in the engineering industry. It is quite common on petrochemical projects where plant, pipework, equipment and vessels are purchased as separate packages and/or prefabricated away from site.

Where such items are delivered late the potential for delay to the contractors work exists. Disputes often arise in connection with the method and timing of the call off of items, the method of delivery and in respect of the quantities required, delivered, wasted and/or spoiled.

If any employer provided materials are defective either in quality or for fit then they may have to be returned to the supplier or undergo repair or improvement work on site. In either event there is potential for delay to on site work. The incentive for employers or contractor to purchase materials appears to be the notion that the larger organisation will obtain a better buying advantage, probably across a number of projects. Analysis would indicate that that better buying advantage would need to be substantial to out-weigh the additional administrative cost to both parties and the ensuing arguments.

Complaints are likely to include problems associated with:

- timing and sequence of deliveries;
- shortages;

- quality and/or defects.

Complaints about defects are most likely when the free issue material is, in some way, pre-worked eg pre-assembled pipe spools and tanks, flue or boiler casings, linings and components and the like.

#### **4.5.1.5. Instructions Regarding Postponement of the Works**

Wholesale postponement of construction projects is rare. Where effective postponement is caused by some intervening event or occurrence there are separate provisions dealing with many of the potential areas where postponement might otherwise be appropriate. The need for a postponement provision, is in practice, therefore quite narrow. For example the provisions relating to access to the site, provision of information, materials required for incorporation, etc.

#### **4.5.1.6. Failure by the Employer to Give Access**

An employer is unlikely to agree a commencement date with a contractor unless he is sure that he can provide access. The relatively short mobilisation period required means that the employer need not make a long term commitment. Where there are potential difficulties in providing access an employer is more likely to accommodate this by arranging for mobilisation work to be carried out under a letter of intent. Failure to provide access is more likely to cause a problem where access to some part of the work is to be provided part way through the contract.

Where work has started on the basis of a letter of intent there may subsequently be difficulties in concluding an agreement. This may be particularly so in connection with commencement and completion dates if the letter of intent placed a restriction on expenditure or if delays have occurred. See in particular the effect of this problem in Monk<sup>12</sup>. Norwich

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<sup>12</sup> Monk Construction Ltd v Norwich Union Life Assurance Society. (CA) [1992] 62 BLR 107.



Union had to pay Monk on a quantum meruit basis because there was no concluded agreement following a letter of intent. It was quite clear from the facts of the case that Monk had deliberately manufactured that situation.

As between contractor and sub-contractor there are far more complaints about the failure of contractors to give access and also complaints about the failure to give exclusive access. Confusion about access dates and the relationship between the activities of other sub-contractors could be reduced by a proper consideration of the programme issues. This is seldom done in practice. See further under the heading of inadequate planning below.

#### **4.5.2. Excusable Non-Compensable Delay**

The financial risk associated with certain causes of delay is shared between the parties. The contractor will receive an extension of time but each party will have to bear its own time related losses.

These include causes which are the fault of neither party. Most of the standard forms provide that the following matters give rise to excusable non-compensable delay:

- force majeure;
- delay on the part of nominated sub-contractors;
- inclement weather;
- failure, in certain circumstances, to obtain materials or labour;

Contractors generally would prefer to avoid making delay claims under a head which does not allow compensation. A common theme with all these heads is that although they may cause delay both contractors and

employers have an interest in attributing the claim under a different head. Contractors will seek to bring a claim under a head which leads to compensation.

Nevertheless, although a contractor does not recover delay costs in respect of such a head, on a job where he has performed badly an unpaid extension is preferable to paying damages to the employer. Conversely an employer would no doubt prefer to see an extension granted for weather rather than one of those matters which would attract loss and expense. For these reasons the non-compensable causes often feature as concurrent causes.

For this reason the analyst should ensure that all alternative causes are properly considered. This will require access to a wide range of documentation.

#### **4.5.2.1. Force Majeure**

Whilst on the one hand this covers a wide class of events many of those events are specifically covered, strikes or wars in JCT80 for example, by other provisions. Perhaps for this reason delay claims are not often made under this head.

#### **4.5.2.2. Delay on the Part of Nominated Sub-Contractors**

Construction contracts such as JCT80 have clear nomination provisions. Problems nevertheless arise under those provisions. Many engineering forms do not include such provisions and more serious difficulty can arise when 'nomination' takes place. When there are no express provisions implied terms may reflect the traditional nomination type responsibilities.

Typical provisions relate to culpable delay on the part of the sub-contractor. Non-culpable, compensable delay for the sub-contractor will,

in normal circumstances, be non-culpable, compensable delay for the contractor. Nominated sub-contractors will normally enjoy similar relief, and be capable of causing culpable delay for similar reasons to those set out below in respect of the contractor and sub-contractors generally. Notwithstanding that the nomination process ought to resolve contractual arrangements problems do arise. Problems arise in respect, particularly of matters which relate to the integration of the sub-contractors work in the contractors programme. These matters include:

- start and finish dates;
- sequence and method of working;
- timing of work in relation to the work of others;
- dates for the provision or receipt of information;
- rate of progress;
- adequacy of resources, whether plant, labour, material or managerial;
- attendance required.

See under sub-contractors below for further description of these problem areas.

Delay by a nominated sub-contractor is, strictly speaking, non-compensable from the contractors point of view. The contractor will not be able to recover from the employer but he should be able to recover from the defaulting sub-contractor. Contractors seem anxious, however, to avoid this cause. Most contractors would prefer to allocate losses to employer caused delay. It is likely that contractors are less able to recover from sub-contractors and it is often the case that the contractors own interests are best served by working with rather than against his sub-



contractors. This is so whether the sub-contractor is nominated or domestic. Here the contractor has a dual interest, both to recover his own losses and to complete the work.

So far as the recovery of the contractors losses is concerned it is unlikely that the sub-contractors performance is the only cause of delay and the contractors prospects of recovering his losses are better if he can present a consistent claim for the project as a whole rather than blaming the employer for part and the sub-contractor for the balance.

Although possibly to a lesser extent with nominated sub-contractors, contractors have been known to pressurise sub-contractors to reformulate their claims to avoid placing emphasis on poor performance by the contractor.

It is important to a proper resolution of such issues that the analyst see the dealings between contractor and sub-contractor.

#### 4.5.2.3. Inclement Weather

Where parts of the work or the whole of the work is open to the elements there is the potential for delay being caused by inclement weather. The usual contract provisions are intended to give relief in the case of exceptionally inclement weather. Despite the British preoccupation with the weather and the frequency with which weather causes problems on construction sites an objective test is not available.

Not all delays caused by weather will automatically qualify. The question of foreseeability is relevant. A US Judge<sup>13</sup> put it like this:

*"On a 400 day sub-contract you cannot expect 400 days of fine sunny weather"*

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<sup>13</sup> DeSombre v. Bickell 118 NW 2d 868 (Wis. 1963).

This raises the question of what ought to have been allowed, by the contractor, in the original plan.

#### **4.5.2.4. Failure, in Certain Circumstances, to Obtain Materials or Labour**

This has not been found to be a common cause of delay in the disputes analysed. For the reasons set out above in respect other matters contractors would prefer to bring delay claims under a head which leads to compensation.

Failure to obtain materials which are part of the contract or sub contract should not be confused with the situation where the employer or main contractor is responsible for providing free issue materials.

#### **4.5.3. Non-Excusable Delay**

These matters are not specifically itemised in the terms of contract. The following matters are typical examples of the causes of non-excusable delay found in the field study:

- inadequate planning;
- use of inappropriate methods or sequence of work;
- defective or incorrect work;
- inadequate resources, whether plant, labour, material or managerial.
- failure to make proper arrangements with suppliers or sub-contractors;
- delay on the part of suppliers or sub-contractors;

##### **4.5.3.1. Inadequate Planning**

There is potential for the planning methods simply to be poor. Inadequate

or inappropriate methods may have been used. Such failings are unlikely of themselves to have been the cause of delay. A poor programme or a lack of adequate planning and control may prevent delay from being recognised and minimised. Notwithstanding such failings the plan may reflect correct durations and logic.

Delays are, however, sometimes apparent simply because the time originally allowed for an activity or the project as a whole was inadequate. Under-allowance can arise for large number of reasons. Surprisingly, however, an extremely common cause is the simple failure to take full and proper account of the information available when the original duration was established. The factors which ought to be considered when establishing the plan as set out Section 3.7 3 above are often ignored.

The analyst will seek to discover whether and if so to what extent these factors were considered in preparing the original plan. Again this information may not be readily available and, in the vast majority of disputes, appear not to have been consciously considered at all in making the plan. This is not fatal to a proper analysis because the analyst can produce an As-Achievable plan using the information available when the original plan was prepared. Such an analysis is prone to the criticism that it is prepared with the benefit of hindsight and therefore in some way anticipates the problems which actually arise or that it is simply self serving and prepared to show the answer that the analyst would prefer. Clearly, if it is to be persuasive, any analysis must be capable of defeating such criticisms.

The definition and management of the relationship between the work of different trades is a major area for dispute and a frequent cause of delay. It is common practice within contracting organisations to provide only an outline of the relationship between, often competing, trades contractors.



There are two main themes in the reasoning behind either not producing a detailed programme or for keeping it from the trades contractors. The first is that the provision of detailed information about when each element of a trade contractors work is required and it's relationship with the elements of each of the other trades contractors work would provide ammunition to the trades contractor to make a claim if the work does not proceed to the plan.

This seems defeatist. It draws into question the adequacy of the contractors approach to construction project planning and suggests a desire not to alert a tendering sub-contractor to real difficulties which may impede his work.

The second theme is that the contractor or more specifically the construction manager believes that the package contractors should be allowed the freedom to plan and co-ordinate their own work with that of the other trades contractors. On the face of it this can sound both logical and appealing.

But how can this be managed and controlled. At some stage the programmes for each trade contractor must be brought together and co-ordinated. Clearly this can only be done as the trades programmes become available. It may therefore be well into a project before major clashes and pinch points are identified. Co-ordination between trades then becomes a fire fighting exercise.

The direct effect of this is that the broad outline or strategic programmes are not capable of being maintained and delays occur. A further consideration is whether the outline programme is sufficient to put a defaulting sub-contractor on notice of the effect that delays, particularly to intermediate stages of his work, have on the work of other trades contractors.

The duration of activities and of projects is determined by the rate of progress. Whilst it is often assumed that work will be carried out at a constant rate this is not often so in practice.

Clearly the whole economics of linear projects such as road construction are dependant on achieving as constant a rate of production as possible. However on the majority of construction projects, where a large number of interrelated trades are involved, this is unlikely to be sustained over prolonged periods.

Construction contracts seldom include express terms regarding rate of progress, nevertheless when claims are made implied terms are usually relied upon. Programme analysis at a level of detail sufficient to obtain a proper view of production rates is not often done when pricing tenders or before agreements are concluded. Tenderers assume a crude average and then complain when the rate achievable falls below that expected. When production rates fall below that anticipated or required, unless resources are increased to compensate, delay will occur.

#### **4.5.3.2. Use of Inappropriate Methods or Sequence of Work**

The sequence of work and methods of construction have a significant influence on the time required to carry out a particular activity or project. Almost without exception such matters are never covered by express terms in main contract documents and seldom in sub-contracts. This may seem strange when the design of a particular activity or project has evolved around the features and availability of a specific piece of plant or equipment or executing the work by a particular method or sequence. Engineering work in particular may require a unique method or sequence of work. Typically, for the construction phase, these matters are considered to be the exclusive preserve, and probably more importantly from the designers point of view, the responsibility of the contractor.

One notable exception arose in **Yorkshire Water Authority v. Sir Alfred McAlpine & Son (Northern) Ltd.**<sup>14</sup>. This decision will have done little to encourage employers and their advisers to include express provisions in construction contracts in respect of method and sequence. This is a pity because the proper resolution of such matters early in a project may result in a better distribution of risk between the parties and may, in the end, result in more economic construction.

If for example an engineer says I have designed this basement in a way that requires it be built in a top down sequence. The actual sequence required is that the site be stripped, piles driven, the retaining wall formed using a diaphragm wall, the ground floor slab laid, spoil is excavated and finally the basement slab cast.

It hardly seems economic that the contractor be told well this is what we have assumed but it's all your responsibility so you must draw your own conclusions about economics and viability. This will mean the contractor having to duplicate some of the work already done by the engineer in an area where often the distinction between the design of temporary work and the design of permanent work is not always clear.

Whether unfair or wasteful this is not, in practice, a major source of dispute between employers and contractors. The most frequent exception is in the case of nomination.

Disputes also arise between contractor and sub-contractor when those responsibilities are sub-contracted. The design and construction of temporary works such as earthwork support, formwork and temporary

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<sup>14</sup> **Yorkshire Water Authority v. Sir Alfred McAlpine & Son (Northern) Ltd.** (QBD 1985) 32 BLR 114. The defendant submitted a bar chart and a method statement with its tender. The plaintiff approved the method statement and the minutes recording that agreement were incorporated in the formal agreement between the parties. In the event it was impossible to follow the method statement and the defendant altered the flow of work. In a judicial review of an arbitrators interim award it was held that the incorporation of the method statement imposed upon the contractor an obligation to follow it. The method statement therefore became a specified method and the change to the sequence of work due to impossibility within clause 13(1) of the ICE conditions gave rise to a variation under clause 51 and payment under clauses 51(2) and 52.



support for steelwork or precast concrete members are often sub-contracted to specialists.

A substantial dispute arose on a project where the formwork for a complex steel and concrete structure was intended, according to the engineers design, to provide temporary support to steel columns and arches. The temporary works provided were, in the event, neither strong enough or accurate enough to support the steel. The steelwork sub-contractor was nominated and the formwork, reinforcement and concrete placing was let to a domestic sub-contractor. Neither had allowed in it's price for providing the elaborate fixing and support system required to hold the steel in the temporary condition.

There had been a failure to adequately define the technical requirements or the design responsibility for matters directly related to the method of construction. This led to a complicated dispute and caused significant delay to the project.

#### **4.5.3.3. Defective or Incorrect Work**

If a contractor incorporates defective or incorrect work, its rectification is likely to cause delay. That delay may or may not be on the critical path. Plant and labour resources may have to be diverted from other work or additional resources obtained. Managerial resources may be diverted. There is a current trend towards quality management, the object of which is to reduce or eliminate such wasted expenditure and delay.

Defective or incorrect work may occur due to the use of inadequate or inappropriate resources or management failing. In theory such occurrences ought to be reduced with increased use of quality management procedures. It can be anticipated that such records may prove a fertile source of information regarding defective work carried out and the amount of remedial work required. It is also likely that the failure to keep adequate records of all activities will be less easy to justify.

Contractors often seek to ascribe an increase in the occurrence of defective work to the disruptive effect of late and/or inaccurate information for construction. If this were the case it would be an inadequate and inappropriate response by the contractor to such a problem.

Arguments often arise in respect of defective work. Contractors will say that the work is adequate or that work inspected at an intermediate date will be corrected by completion. When the rectification of defects is deferred the impact of the rectification work may not be easily allocated to the correct cause. Whether defective work has been corrected may be an important factor in determining when practical completion has been achieved.

#### **4.5.3.4. Inadequate Resources**

It is reasonable to assume that a contractor or sub-contractor taking on work will have sufficient, adequate resources to carry out the project. It is probable that that much at least is a contractual obligation. What is questionable is whether those obligations are clear enough.

It is the practice of some employers to make the use of a particular team a precondition to appointment for a project. It is difficult, however, to make such a requirement a term of the contract. Provisions such as those that require that key staff shall not be removed or replaced without prior notice or approval are often included in construction contracts. There is no real sanction against the contractor who wants to move a particular member of staff to another project. In any event such provisions are of little use if a particular person refuses to complete a project, becomes ill or leaves the employ of the contractor.

Where the quantity of resource is less than the required level the activity to which it is allocated will not proceed as planned. Where there is float

on an activity this may be a conscious and indeed legitimate and prudent management decision.

In certain circumstances failure to obtain labour may be a non-culpable cause of delay.

#### **4.5.3.5. Failure to Make Proper Arrangements with Suppliers or Sub-Contractors**

Arrangements with suppliers and sub-contractors can be difficult to conclude. Each agreement has its own price and programme to be settled. Often these arrangements are not in place before performance is required. This is likely to be reflected in a reluctance on the part of the supplier or sub-contractor either to start performance or to perform at the full rate required.

On occasions work is carried out to completion with no concluded agreement in place. This can happen as a result of a simple failure to agree terms or by design on the part of an unscrupulous sub-contractor. Such a situation is more likely to arise with sub-contractors than suppliers. Terms are more readily agreed with suppliers. If a sub-contractor, or a main contractor for that matter, has started work on site without agreeing terms and subsequently discovers that his price is not a profitable one or is in some other way an onerous one he may see benefit in not agreeing terms. His objective then would be to seek recovery on a quantum meruit basis. As to which see above in respect of Monk<sup>15</sup>. On a quantum meruit basis the contractor would be entitled to recover a reasonable price for the work and be entitled to complete the work in a reasonable time. This is clearly an extreme but a contractor may have little control over such a sub-contractor.

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<sup>15</sup> Monk Construction Ltd v Norwich Union Life Assurance Society. (CA) [1992] 62 BLR 107. Norwich Union had to pay Monk on a quantum meruit basis because there was no concluded agreement following a letter of intent. It appeared from the facts of the case that Monk may have manufactured that situation.



Start and finish dates particularly related to sub-contract arrangements often cause difficulty even though on the face of things they are covered in the agreement.

It is not unusual to have a sub-contract without specific start and finish dates. It is often convenient for the main contractor, and on occasions the employer, to refer to a fixed contract period without making a commitment to a commencement date. Such an agreement will provide that the contractor will start work within a set period from receipt of an instruction to commence. The completion date will be determined by the addition of the fixed contract period. This may pose little difficulty in the case of a main contract where the start date is not too distant.

The implication for sub-contractors whose work is not due to start for some time is more onerous. In a rising market there will be the pressures of inflation and the impending start may also create difficulties in respect of the ability to make commitments to other work.

This approach is less favourable for sub-contractors whose work is required at the tail end of a project. A main contractor, particularly in a rising or potentially rising market, will wish to conclude an agreement with its preferred sub-contractor as early as possible to ensure that he has a binding price and commitment to programme. These commitments are necessary from the contractors point of view in order to spread the risk associated with the project.

Where a sub-contractor's work is not due to start until the tail end of the main contract the contractor will be reluctant to conclude an agreement that sets a fixed date for commencement of the sub-contract work because if the early part of the project is delayed the contractor will be vulnerable to a claim from the sub-contractor for delay before he commences on site.

Main contractors therefore seek to conclude an agreement whereby the sub-contractor is bound to price and period on site without the commitment to a start date. On this basis a sub-contractor will not be able to recover losses caused by a delay to commencement.

Sub-contractors are often unaware of the potential impact of such provisions.

A further development of this approach is to conclude an agreement whereby the sub-contractor is bound to work 'to the main contractors programme' or 'as directed by the main contractor'. These are extremely onerous conditions for the sub-contractor and create an open ended commitment on his part.

Claims for delay and therefore recovery of losses due to delay are either severely restricted or effectively precluded under such an arrangement. As with the previous arrangement, it is nevertheless possible that there may be some scope for implied terms, if there was unreasonable delay there may also be other remedies for example through the doctrine of frustration. Refusal to perform because of a delay in commencement would be a breach of contract.

Often sub-contractors who find themselves in such circumstances do not perform well, the project having become unattractive financially or because resources have been committed elsewhere.

So far as their domestic arrangements are concerned the risks associated with the resolution of such matters is born by the contractor. These are matters, however, which are not readily evident to the analyst. Documents relating to such transactions are not often provided voluntarily. Such information may also be difficult to locate during the formal discovery process associated with litigation or arbitration.

#### **4.5.3.6. Delay on the Part of Suppliers or Sub-Contractors**

Once a proper appointment is in place difficulties may still arise due to the poor performance of suppliers or sub-contractors. Suppliers may be merchants or producers. Merchants are dependant upon their suppliers and may experience difficulty satisfying the order. Producers will have commitments to other customers and may have difficulty producing the quantity required. With some materials, for example bricks or natural materials, the product may have variable characteristics and the quality required may not always be available.

Sub-contractors performance may cause delay and the range of potential causes will mirror the same list of potential causes as set out above in respect of main contractors, even down to the use of sub-sub-contractors.

The field study revealed the following areas where problems are likely to arise between contractor and sub-contractor:

- sequence and method of working;
- timing of work in relation to the work of others;
- rate of progress;
- adequacy of resources, whether plant, labour, material or managerial.

These matters, more fully described above in terms of contractors failings, are equally applicable to the relationship between contractors and sub-contractors.

These are also matters which are at the risk of the contractor and peculiarly within his knowledge. Information which reveals the true state of such transactions may be difficult to obtain.



#### 4.6. Employers Claims Against Consultants

In practice the terms of construction contracts provide the employer with the prospect of compensation should delay be caused by the contractor. When things do go wrong it is often found that even though the employer has stuck to his side of the bargain he is nevertheless responsible for delays caused by his consultants. In practice he has little control over the performance of either the contractor or his own consultants.

When the project is late and the contractor has been or is likely to be paid compensation for delay the employer will want to know why. It may be that such matters have been analysed and blame allocated as the project progressed. This, whilst possible, does not normally happen unless the blame is entirely with the employer. The employer may, consciously, have required additional work or other variations and accepted the need to extend time and pay compensation. Here the cause of the loss is clear and does not require further analysis.

Where the cause of delay has been hotly contested throughout the life of the project the allocation of blame may not be obvious. This is because the methods of planning and progress control used for construction work are often too crude to either measure delay accurately or identify the cause of any such delay with any degree of accuracy or at all. The circumstances which give rise to this situation are discussed more fully in the section dealing with Inadequate Planning above.

The cause of delay may not have been established because the architect, or engineer, is reluctant to recognise his own failings. Referring to the potential reluctance of the architect to certify his own failings Fenwick-Elliott<sup>16</sup> says *'the architect is often unwilling to do this, and this frequently leads to a dispute requiring litigation or arbitration.'*

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<sup>16</sup> Fenwick-Elliott R J, (1993) Building Contract Litigation, Longman.

Employers are becoming more conscious of the effect of poor performance by their consultants. Contractors, once to some extent deferential towards consultants, are quite happy to complain about poor performance on the part of the consultant.

Employers, to some extent sceptical about the construction process in any event, tend to take an increasing interest in matters affecting quality, cost and time requirements of their projects. When funding institutions are involved they often appoint their own consultants to protect their interests, particularly in respect of quality. Where the funding institution has a direct financial interest in the completion date such consultants will also be concerned with performance against the programme.

There is, therefore, no shortage of commentary on the performance of those responsible for designing and administering construction work.

It is ironic that the wider deployment of consultants may, at least in some instances, be responsible for an increase in the number of claims against their colleagues rather than the improvement of construction quality they were employed to assist in achieving.

Throughout the life of the project and during the settlement of the contractors claims it probably will not have occurred to the employer that although he may have to pay the contractor for delay caused by the poor performance of his consultants he will not have an automatic right to recover from the defaulting consultant. The reason for this is simple. The contractual obligations of the employer to the contractor in respect of those matters which the employer has contracted with the consultant to provide are absolute, whereas the obligations of the consultant to the employer are normally only to execute the services to the standard expected of an ordinarily competent practitioner. It is unlikely that there will be any provisions in the consultant's agreement relating to the time for performance of the consultant's services. On the narrow point it must

be that there would be an implied term that the consultant would not delay the contractor, but such a term will fall short of being an absolute obligation.

To have caused delay to the contractor under the terms of the construction contract the default of the consultant must relate to those terms. From the analysis of the causes of excusable compensable delay to contractors carried out in Section 4.5 above the following are potential areas for default by consultants have been identified:

- issuing instructions for additional or varied work:
  - relating to resolution of details that cannot be constructed;
  - relating to resolution and rectification of defective design;
- instructions relating to the incorporation of statutory requirements relating to safety, health, welfare, fire precautions etc;
- instructions relating to the incorporation of employers requirements.
- late provision of information:
  - information provided to replace missing or inadequate details;
  - late selection of materials, colours, etc or other matters of choice;
  - late nomination of sub-contractors or suppliers;
- delaying the appointment or progress of artists and tradesmen;



- delaying the ordering or supply of plant, materials or equipment which the employer is responsible for providing;
- failing to correctly advise the employer regarding postponement or unnecessarily or wrongfully postponing the works;
- failing to correctly advise the employer to give access or failing to give proper notices to the contractor.

A time analysis will determine whether these matters have caused delay. For an employer to succeed with a claim against one or more of his consultants, however, he will also have to show that the consultant has failed to perform to the standard expected of an ordinarily competent member of the profession. This standard may be quite low and therefore employers often include a requirement that the consultants performance shall be of the highest standard of the profession. Even this higher standard does not amount to the absolute standard or warranty required of the employer under the construction contract.

The standard of performance required will be a matter of construction and will depend upon the particular provisions of the contract for services. In order to prove his claim against the consultant the employer will probably need expert evidence on the question as to whether the level of performance of the consultant actually fell below the required standard. This question is beyond the scope of this work.

It is true to say that it is difficult to find suitable experts to assist in identifying potential poor performance by consultants. This is particularly true with the engineering professions.

On the question of the quality of performance it is thought likely that the introduction of quality management systems may have some interesting results. Particular points include:

- the likelihood that employers will seek to employ consultants who practice quality management procedures;
- whether failure to follow procedures would on its own be negligence on the part of the consultant where adherence to such procedures would have avoided the error or omission;
- the likelihood of records of failure to meet required standards being used against the organisation keeping them.

It is arguable that an employer may have a legitimate claim against his consultants in a situation where the contractor has not received an extension of time. In determining the contractors entitlement to additional time the Architect, quite rightly, may have discounted the amount of the award. The discount may be due, for example, because the contractor has not complied with a condition precedent to such an award or because of a concurrent default by the contractor. Here the employer will pay the contractor damages for the excusable part of the delay and deduct damages for the balance of the delay. Where the employers damages are liquidated and therefore limited to the contractual rate they are often less than the actual loss. Where there are concurrent causes during the period when liquidated damages apply and only part of the loss is recovered from the contractor the client may seek to recover for the balance of the loss from the consultant.

#### 4.7. The Method of Analysis

From the general descriptions in Chapter 2 and the method distilled in Chapter 3 it can be seen that the analyst has a choice regarding the approach to analysis. This choice is often compromised by practical and/or commercial considerations.

Having lost time and significant sums of money the parties to a contract are often extremely reluctant to spend yet more money on preparation to

fight a claim for compensation. Therefore a full analysis of the time requirements of a project is invariably not done. This is not to say that no testing of the potential complaint is done. But where it is done it is often by sampling rather than by an exhaustive analysis. Even sampling is not always done. Often significant claims are pursued on the basis of no more than mere perception. That perception is often found to be the product of self-interest.

Claims often start on the basis of those matters which have been the subject of dispute or where poor performance has been identified throughout the execution of the project.

There is a distinction to be drawn between the existence of poor performance and the question of whether that poor performance caused delay.

One is often assumed to follow the other. It may be obvious that the bricklayer is not laying bricks at the required rate. Whether or not the production rate is a contractual term, the question of whether a failure to lay bricks at a particular rate has caused delay to the brickwork activity or to the project as a whole is difficult to determine and to demonstrate. This is what the analysis is required to achieve.

Similarly it may be obvious that a designer is late producing details or that details are simply inadequate. But again the question of this being causative of delay is more difficult to determine. An added problem here of course will be the need to prove that any delay on the part of the designer amounted to a breach of contract.

Hence the primary breach may be well researched but the consequences in terms, primarily of delay and consequently financial loss, are often not. This is quite the reverse of the process found in the various methods described in Chapter 2 and the method distilled in Chapter 3.



Typically any analysis carried out in the early stages of pleading a delay claim is likely to ignore the matter of concurrency.

For example the analysis relied on in **ICI v. Bovis** was primarily related to the date of issue of information, instructions and variations, measured against some notion of the date by which such information ought to have been issued. The failure which caused the continuing embarrassment to ICI was the failure to identify how the late issue of information was causative of delay to the project. Here ICI failed to come near the standard of proof required. Whilst it is impossible to know for certain whether a proper analysis of project performance had been attempted and abandoned<sup>17</sup> or simply not carried out, the consequences were the same. The result in terms of failure and compromise ought to have been predictable.

This brings the question of the choice of the method of analysis and presentation into focus. There is an underlying question as to whether the presentation has to be analytical or whether it is possible to succeed on an entirely descriptive basis.

An analytical basis would require the steps set out in Chapter 2. The logical steps are:

- establish what ought to have happened: typically represented by an As-Achievable plan;
- establish what actually happened: typically the as-built data;
- prepare an analysis and explanation of the differences between the As-Achievable plan and the as-built data;
- presentation of the results.

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<sup>17</sup> It was suggested by those in the know that the time analysts employed by ICI had been paid more than £0.75m.

Such an approach would inevitably result in a positive commitment to a limited view of both the causes of delay and criticality within the project. There is reluctance on the part of those who have the conduct of such matters to make such a commitment.

The descriptive basis is reliant upon contemporaneous record, often anecdotal, evidence and mere assertion of criticality<sup>18</sup>.

Claims are generally presented on the descriptive basis. Some with a degree of analytical basis but most with none.

Where claims are resolved during project performance, the participants being directly conscious of the matters complained of, such presentation may be both convincing and conclusive.

Where claims are not resolved during project performance the requirement, from those defending the claim, for there to be a more persuasive approach is likely to increase.

In litigation or arbitration it is not apparently sought to deny the relevance and evidential necessity of the principles underlying the analytical basis but to attempt to deal with them descriptively. Often, whilst acknowledging the need for an analytical basis, it is sought to defer such analysis to be dealt with as part of expert evidence. This on the basis that the allegation to be met is clear and that the proof of such allegation is a matter of evidence.

It is currently an unresolved debate as to how far down the analytical route it is necessary to go to avoid the complaint of non-particularisation.

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<sup>18</sup> A prominent member of the construction bar recently counseled against the use of any form of critical path analysis and of any reference to matters of criticality within the pleaded case.

#### **4.8. The As-Achievable Plan**

Where time claims are made the basis of analysis is usually either the contractors original tender or construction programme or a rationalisation thereof. Such plans are invariably used with little or no consideration of their adequacy. To use such a presentation unchallenged would be to assume, in favour of those pursuing a claim, that such a plan was achievable.

It may be thought that the use of such a plan might equally be against the interest of those making the claim. Whilst this is possible it is considered unlikely that a shorter period could validly be imposed as a basis for defending a claim. Clearly where those making the claim wish to show an ability to finish earlier than the original completion date they would be departing from the original plan in any event.

After some consideration it is not unusual to find errors or inconsistencies in plans used as the basis for time claims. Such matters may include:

- durations which are too long or too short;
- inadequate level of detail;
- poor or impossible logic;
- failure to allow for resource constraints.

Where an activity duration was too short it would be wrong to allow direct comparison with the actual duration or a duration calculated to reflect actual performance conditions, as this would allow the contractor to recover his original underestimate. Where an over long duration was shown originally it would also be wrong simply to add an allowance for any additional work. This situation will of course raise the argument



about the ownership of float. The matter of float should be considered on its merits and not concealed in generous activity durations.

Contract or tender programmes often show very little detail. A valid comparison of planned and actual performance requires an adequate level of detail. What is adequate depends on the size, complexity and overall duration of the project, the level of detail of as-built data and the extent, number and complexity of the delay(s) to be analysed. It may be appropriate to deal with discrete parts of a project or particular time periods. An analysis of a discrete time period is often known as a window analysis. The analysis of part of a project will require the use of a sub-project or fragnet. When using such an approach it is necessary to have regard for the overriding principle that it is the impact on the completion date which needs to be established.

It is equally possible to have too much detail. Practically speaking it is difficult to manage a programme of more than about 250 activities. Clearly computers are quite capable of handling thousands of activities. However, from the point of view of understanding how the programme works as an entity and having a reasonable prospect of predicting the likely outcome of any adjustments, overall size is best limited. Where, in the absence of a suitable programme, an expert has prepared a programme or perhaps where a bar chart has been converted to a network the expert may need to justify any part of that programme under cross examination. An expert would be in a difficult position if he were unable to keep reasonable track, in his own mind, of how the programme works and at least in general terms what the impact of a particular adjustment might be.

The presentation of delay claims generally acknowledge the concept of critical and non-critical activities and critical and non-critical delays. Such concepts are, however, often deployed without any basis in analysis.

Some logic is, in the normal sense, absolute. For example concrete in trenches cannot be placed until the trenches have been excavated. A logic sequence which had the concrete being placed before trenches were excavated would be impossible.

Logic may be preferential. That is a number of activities may be carried out in any one of a number of sequences. It is possible, for example, that firespray to a steel frame could be carried out before the blockwork partitions are erected or the sequence could be reversed. There are, no doubt, a number of arguments for and against either sequence but both are feasible and, all other things being equal, the overall time requirements are likely to be similar.

A programme may be theoretically sound but fail to recognise resource constraints. Clearly a programme which demands more of a resource than is obtainable cannot be achieved. There is a point of diminishing return in the application of a large number of resources. This is due to problems of supervision and congestion. There is also often a limit to the number of resources which can be deployed at the available work front.

#### **4.9. The As-Built Critical Path**

In practice it is difficult to produce an As-Built network showing a clear critical path. There are a number of reasons for this:

- It is common for activities to be completed no sooner than they need be. Consequently all predecessors are likely to have little float;
- Normal constraints of record keeping may mean that insufficient information exists to make an absolute definition of content or precise start and finish dates or points of transfer from one activity to another;

- There is a continual conflict between only applying sufficient logic to respect real constraints on the one hand, and fully explaining why activities start or finish when they do on the other;

On a large project the number of activities and, consequently logical relationships will be large. In order that the development of a network can be achieved in a logical and methodical way and be adequately recorded a process of clearly defined stages should be followed. The following stages can be identified:

- Collect basic data:
  - Establish list of activities and define content;
  - Identify start and finish dates for each activity;
  - Calculate actual durations in working days to respect planning software calendar<sup>19</sup>;
- Draw the As-Built bar chart. This will be used as a framework against which to apply logic;
- Apply common sense planning logic to actual activities. At this stage the logic should be allowed to follow the actual method and sequence employed. At the end of this stage it is likely that the project duration will be shorter than the actual duration. In the shortened project the resulting sequence should be checked to ensure that resourcing and other physical constraints are respected;
- Adjust logic to place activities on the as-built dates.

If the presentation is to be used as a stand alone As-Built or But-For

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<sup>19</sup> There is a potential difficulty here in that some activities may work during holiday periods.



analysis the following further stages will be required.

- Consider durations. Any durations that are longer than they ought reasonably to have been should be reduced. The calculations for the reduced durations should be established using normal planning techniques and properly recorded. In the shortened project the resulting sequence should again be checked to ensure that resourcing and other physical constraints are respected. The reduced durations should be replaced with delaying activities. In the But-For the delaying activity durations will be set to zero;
- Consider methods and sequencing actually employed. Any method or sequencing constraints that are unnecessary and which should have been avoided should be released. In releasing these constraints normal planning techniques should be used and the necessary calculations diagrams and sub networks properly recorded. In the shortened project the resulting sequence should again be checked to ensure that resourcing and other physical constraints are respected. The logic adjustments should be replaced, where possible, with delaying activities. Where it is not possible to replace the logic with delaying activities then the logic links will have to be adjusted between the As-Built and But-For conditions. In the But-For the delaying activity durations will be set to zero.

With the delaying activities set to zero duration, the network will have relaxed to its minimum duration;

- Using a But-For versus As-Built comparison consider the differences between the but-for or as-achievable dates and the actual dates for each activity. The explanations should be incorporated into the network as 'delay activities' used to shunt the work activities into their correct positions. It may be necessary to shadow these delay activities to reflect those caused by different parties. It is necessary to insert the

delaying activities in a structured way to ensure that their removal will always provide a proper result. The network ought now to reflect the actual overall duration with individual activities in their correct positions;

- Documentation. The results of the analysis should be described in detail. Each delaying activity should have a full explanation.

The network should, where possible, contain finish to start relationships with zero lags and there should be no imposed dates. Finish-to-Finish and/or Start-to-Start relationships should only be used for non-determinate activities.

#### 4.10. As-Built Data

Given the key importance of having a comprehensive set of as-built data such information is often sadly lacking. Information is often patchy, full information for some activities and very little for others. This makes analysis at a uniform level impossible. If the analysis is not uniform in approach some delays may not be revealed and others may be distorted or over emphasised.

The analyst is keen to identify a number of things:

- the start and finish dates of activities;
- intermediate progress status;
- confirmation of working constraints and relationships;
- changes to project content and environment and the impact thereof;

Planning software such as OpenPlan which has Dbase as an underlying framework are ideal because it is easy to attach fields to the data files to

contain reference material for the source of as-built dates and in respect of the logic links. With logic links this particularly useful where the logic has to be adjusted to accommodate as-built dates.

It is a basic requirement of any analysis that the start and finish dates of the key activities are determined. What constitutes a key activity will depend upon the facts of the dispute.

The need for intermediate data may not be obvious. In many disputes it may be both proper and adequate to consider the final position only. It will be essential to have intermediate data to complete an analysis using the contemporaneous methodology.

There are a number of situations where intermediate data would also be required for an analysis prepared using the As-Built methodology. It may be that the job is simply too large to be considered in a single slice. It may also wrong, conceptually, to overlook what the intermediate position may have been. In these disputes the technique of window analysis may be appropriate. This would involve taking the analysis at a number of key or regular dates through a project. Conceptually driven reasons for slicing may include a necessity to analyse the need for the introduction of accelerative measures, the resolution of issues of concurrency or consideration of the position prior to the issue of a particular instruction or the occurrence of a particular event.

The analyst needs to understand the relationship between activities. The original plan will have been premised on a particular approach or method of construction which would generate a particular set of relationships. These may or may not have been recorded. If the original plan is in bar chart form, as most are, this information will only potentially exist in the form of a method statement. It may also be possible to rationalise the apparent relationships. A linked bar chart may give some clues to the thinking of the planner. Bar charts are however seldom produced in



sufficient detail for all logic to either be described or deduced. The proper use of a computer network implicitly requires that activities are logically linked.

Computer planning software is often, however, exploited simply to fix activities in what is perceived to be their correct date slots. On a number of projects review of the analysis has shown that bar charts have been crudely converted in this way simply to meet the contractual requirement to produce a network. The resultant network is therefore not produced by use of the analytical process but is simply a computer drawn version of the bar chart.

Most contractors keep the type of records which are likely to contain as built information. However a clear concise record of when key activities start and finish is rarely kept as a separate record. Marked up plans are most informative and are often kept but seldom survive to project completion. Engineers for example often keep extremely detailed location plans of concrete pours, but by the time the project is complete they may well have been lost.

In addition to obtaining start and finish dates the analyst will be seeking to identify information regarding performance generally. This information, ideally, should provide the explanation for the differences between planned and actual performance.

Formal progress reports can be misleading. Where these are prepared by the contractor for presentation to the employer or his representatives they may at best only reveal part of the picture or at worst be deliberately misleading. So far as reporting progress against the programme is concerned there may be some dispute about which is the current programme as well as about the actual status of the individual activities. Programmes which do not have a critical path or critical path networks

which are not re-analysed using the actual progress data cannot properly identify the current critical path or a realistic completion date.

Where a project is in trouble there is rarely consensus between the contractor, sub-contractors, employer and consultants about the cause of any shortfall in performance.

Contractors often produce progress reports for internal consumption. Many contracting organisations require each project to provide a monthly performance report. Such a report will contain financial and progress data, measured against the contract price and programme, with the primary intention of predicting overall project profitability. A well produced report will consider the cost and value of the project, making allowance for over or under valuation, claims (both financial and time based) from and against the employer, sub-contractors and any other parties and give a brief analysis and explanation of progress achieved. Clearly a proper consideration of performance against the programme is necessary to determine the financial status. These internal reports are likely to be more objective than external reports. They too may however be biased for reasons of self-interest on the part of the individuals preparing them. The rationale is simple; if there is a loss, either financial or in terms of time, the two most likely causes are failure on the part of the employer or his consultants or failure of the contractors own management of the project. There may be a reluctance on the part of site management to concede that the fault is with them. This factor can, in a limited number of disputes, be identified as the reason why ultimately worthless claims have been pursued.

Site diaries are kept formally and informally. There is sometimes a requirement for the contractor to keep a job diary. Such a diary might be required to be completed on a daily basis and record such matters as weather conditions, visitors to site, instructions received, queries raised, work in progress, labour on site etc. If properly kept such a diary will be

invaluable. Unfortunately such a requirement is not a high priority and if required at all is not honoured or enforced and where provided not well produced. Where they are produced they are less likely to be biased. This is probably partly due to the difficulty in presenting such data in anything other than a factual way and maybe coincidentally the type of staff most likely to be charged with keeping such records are unlikely to have the inclination or ability to consistently introduce any bias.

Consultants are often required to keep job diaries. Site architect, site engineer or clerk of works normally keep diaries. Requirements and scope are similar to those above. There are however problems with consistency and a lack of objectivity. Such personnel seldom follow a job from start to finish. The quality of such staff and their approach to record keeping is widely variable. Such staff and particularly engineering staff often have an arrogant attitude to contractors. It is remarkable to observe the extent to which the attitude that 'all contractors are crooks' prevents or impedes the objective resolution and/or reporting and/or recording of construction problems.

Allocation sheets are often kept by contractors for their own internal cost recording/reporting purposes. These allocation records may be kept for plant and labour and if properly completed will, on a daily basis, record each type of labour and/or piece of plant and the type and location and quantity of the work done. Occasionally the keeping of such records is a contractual requirement. Where such documents are well kept they are a valuable source of data which enables the start and finish dates of elements of the work to be determined and the level of resources consumed in completing that work to be established. Such records used to be necessary for the calculation of bonus payments. As a large proportion of construction work is now sub-contracted the day-to-day need for such records to be kept by main contractors has diminished. Although they are still used in the process industry where 'controlled sites' are common, such systems are often found to be cosmetic.



Contractors do require to keep a minimum level of information for plant and labour for the purposes of payment. Whilst not as detailed as daily allocation sheets such records will provide some valuable information. Provided the records can be properly identified as relating to the particular project then certain basic information can be extracted. Wage records must at least include names of employees and amounts paid if not the actual hours worked. With employees names it ought to be possible to determine what their trade is. Using this information it is therefore possible to determine when the major elements of construction were being carried out. Similarly the larger pieces of plant are likely to be activity specific. The introduction and removal of a tower crane, for example, can give clear clues to the state of progress.

Progress photographs can be extremely helpful if they are properly dated. They are however more helpful in a positive sense than in the negative. Clearly anything actually shown on a photograph must have been done. However it can be extremely difficult to judge how much work is left to be done.

On a shopping centre development a comprehensive set of photographs were produced which apparently showed the centre to be 'complete' in April. However, for a number of reasons, the construction work was not practically complete until the end of June. In this instance the photographs produced in April were misleading. Whilst the pictures were not intended to demonstrate conclusively that work was complete they were weighty evidence to overcome in seeking to properly allocate blame for what happened between April and June.

The minutes of meetings often reflect the debate of opposing views. This can be of great assistance in trying to balance those opposing views. It is often the case that, as the minutes are prepared by one party, the other party considers them to be biased. Whilst this may be the case it would be unusual for such complaints, were they genuinely to exist, not to have

been recorded either in the following meeting or in separate correspondence.

Each project will have its own timetable of meetings. On a large project there may be monthly meetings which involve employer, consultants and contractor, weekly meetings between the consultants and the contractor and between the contractor and his sub-contractors. The contractor's own management function will require internal meetings. Other meetings will be convened to deal with specific matters. Whilst minutes will probably be prepared for all they may not be available to the analyst on a voluntary basis.

The level of detail both discussed and recorded at such meetings varies greatly from project to project. Progress reports may be presented and discussed these may be disputed or agreed. Where they are disputed a consensus may be reached or the matter left unresolved.

Even if such minutes contain no conclusive data they are a good record of contemporaneous thinking and debate and may better reflect the opposing views than subsequent recollection.

It is often the contrast which is provided by the documents which steers the analyst to the truth.

Programmes are often marked up to show progress. A bar chart marked with a different colour each week is an ideal form of presentation. Unfortunately, however, the limitation on the number of colours and the complexity achieved after a limited number updates tend to mean that such documents are short lived. Once outdated such documents seldom seem to survive. As well as the basic limitation of colouring such documents tend to become redundant if the programme is updated.

Despite the visual acceptability of these presentations their use in determining overall progress against the completion date is limited. The

use of a computer network can combine the functions of presenting progress information and calculating the likely effect on overall completion. Despite this advantage the use of computer-generated networks is not widespread. This point is the subject of separate discussion. Where these techniques are used, access to the intermediate data is not always available unless regular back-up copies were produced. Clearly the retention of such data requires the regular storage of historical information. Whilst this function is generally available in planning software such data is seldom retained. Where it is retained its location and successful retrieval from back-up discs is not always possible and is never easy.

Marked up drawings are helpful as a record of progress and to assist understanding of problems encountered. On road construction or repair projects for example such drawings are simple to prepare and provide a good explanation of how the sequence of work developed. On complex construction projects the procedure becomes far more difficult. Basic structural elements lend themselves to this form of recording. More complex trades, for example services installations, are not suitable for such recording. Engineers often keep detailed records of concrete pours so that when subsequent failure of cube tests is identified it is possible to identify the defective concrete.

Although most claim submissions proceed exclusively on the basis of some form of As-Built analysis the as-built data is usually inadequate. Such submissions do not contain sufficient information to make a proper analysis and are not based on a fully rationalised use of all available data.

There are numerous sources of as-built data. Pickavance has a four-page list of potential sources of such data<sup>20</sup>.

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<sup>20</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts, LLP.



#### 4.11. The Analysis

Out of some 50 submissions examined as part of this research all but one have been produced on the As-Built basis.

The one As-Planned presentation analysed as part of this research was produced as expert evidence by an American consultant on behalf of an American contractor in arbitration against a Middle East Government.

There were a number of evidential problems with the presentation:

- there had been no attempt to demonstrate the adequacy of the original plan;
- the analysis sought to maintain unrealistically long lead in periods;
- concurrent causes had not been considered;
- all causes of delay had not been considered and resolved.

In those UK disputes currently reaching the stage of formal arbitration or litigation there is no uniform approach to such claims. The practicality of large complex construction projects tends to force those seeking to prosecute such claims on those projects to adopt what might be described as a 'common sense' approach. The 'common sense' approach is one that is likely to rely on a descriptive rather than a scientific basis. The descriptive approach will attempt to describe the problems encountered and the effect of those problems on the progress of the work. What such an approach lacks in scientific rigour may be compensated for by descriptive clarity.

This approach will likely be based on an As-Built bar chart presentation<sup>21</sup>. The analysis, such as it may be, will compare the As-Built bar chart with some plan for the work and seek to explain the differences. This form of analysis can be identified amongst the techniques deployed in the US as an 'As-Built' analysis. It is not however well regarded and is treated as a second best<sup>22</sup> form of analysis. To some extent it is possible to rationalise the features of this methodology with the marked difference between the US and UK approach to construction project planning. From the foregoing analysis of both UK and US literature, decisions and practice the research has identified the following differences in UK practice:

- The programme used as a baseline will be poorly detailed and if detailed bear little relationship to the contractors original programme, consistent with poor attention being paid to pre-contract planning;
- There is often no attempt to prove a critical path. Such an analysis may indeed seek to suggest that there are several critical paths. Any network used is likely to have been produced for the claims analysis, consistent with there being no original critical path analysis;
- Despite the reliance on an As-Built story the As-Built data may be incomplete, consistent with there being poor record keeping and a failure to update programmes;
- The rationalisation may be remote from the reasons for delay given during project performance, consistent with a failure to resolve time issues as the work progressed and/or keep adequate records.

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<sup>21</sup> This conclusion is mirrored in the results of the survey carried out by Bordoli and Baldwin. Bordoli D W and Baldwin A N, (1998) A Methodology for Assessing Construction Project Delays. Construction Management and Economics 16.

<sup>22</sup> See Callahan Michael T, (1991) Delay Analysis (Page 30), Conference Papers: *'As-Built schedules are the most frequently used, but most misunderstood and misused method of delay analysis'*.

#### 4.12. Presentation

The one As-Planned presentation analysed consisted of bar charts showing the original plan set against bars showing the result of introducing delaying events. The presentation was simple and effective. There were a number of evidential flaws within the analysis but the demonstration of the alleged impact was clear. In this case the simplicity of the analysis was its downfall.

All analyses and presentations reviewed failed to establish what impact, if any, the matter complained of had on the project completion date.

Despite the large sums involved the time claims are, or have been, prosecuted on a descriptive basis rather than on the basis of a scientific analysis. In two particular disputes designers were being sued for alleged defective design work carried out for design and build contractors. These allegations include failings in the initial design which led to an understatement of the contractors tender and failings in the production of construction information leading to delay and disruption losses. Four of these disputes were settled in 1995 by the Defendant, in each, paying sums of several million pounds

These time claims were being prosecuted on a descriptive basis. In each of these disputes the defendant was faced with a huge burden in trying to respond to a diffuse and one sided delay claim and produce a defence that sought to provide an alternative explanation for the delay actually suffered. This defence may require the defendant to examine the whole project performance to defend a selective claim that only covers a small proportion of project performance.

Often there is a temptation to put as much data as possible in to the presentation. This is counterproductive. Presentations which seek to represent all of the available data in a single network or chart will,



inevitably, be over complex to the extent where they become meaningless.

It appears that there is some belief that the production of totally unintelligible chart demonstrates the worth of a claim. Those presenting time claims appear to loose sight of the fact that if all of the original constraints were represented in the same level of detail as used in delay analysis the result would be equally complex.

#### 4.13. Summary of Chapter 4

Section 4.2 provided examples of the type of disputes included in the field study which formed the basis for the analysis in Chapter 4.

The information obtained from the field study and the other sources was collected and incorporated in the following way:

- At the outset of the research, in 1991, the available published material including articles and publications and decisions was identified. Areas considered to be relevant included construction project planning, the use of computer scheduling techniques generally, artificial intelligence, computerised data handling techniques and construction law. Prior to the commencement of this research some basic reference material had already been identified and the work of Wickwire and Smith<sup>23</sup> in particular was considered to be relevant. A significant amount of further material was identified from the regular Abstracts published by the CIOB and RICS and also from the construction press.
- Further material was identified in the cross reference and bibliography sections of articles and decisions.

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<sup>23</sup> Wickwire Jon M and Smith Richard F, (1974) The use of Critical Path Techniques in Contract Claims, Article Public Contract Law Journal Vol 7 No 1, October, 1974. And Wickwire Jon M, Hurlbut Stephen B and Lerman Lance J, (1989) Use of Critical Path Method Techniques in Contract Claims: Issues and Developments 1974 to 1988, Article Public Contract Law Journal.

- Notes were made in respect of the field study and in respect of each of the articles and disputes listed in the Bibliography in Appendix 2. The notes were collected in a database programme. This part of the analysis took place over approximately three years, with new material being entered into the database as it was obtained.
- The notes were sorted into topics which relate to the headings in Chapters 3.
- When sorted the notes were used to provide the basic draft document from which Chapter 4 evolved.
- Since the completion of the initial analysis and drafts all current material has been reviewed and, where appropriate entered directly in to the narrative. There has been a continuing review of articles published in the construction press in particular Building magazine, law reports, in particular the Building Law Reports and Construction Law Reports, legal reviews, in particular the Construction Law Journal, the International Construction Law Review and the Arbitration and Dispute Resolution Law Journal and continued reference to the Abstracts published by the CIOB and RICS.
- The material obtained from the field study was incorporated in parallel with the continuing review.

Section 4.3 considered the general legal principles as related to the time for completion of construction contracts. By and large such provisions are clear but problems are likely to occur in one off type contracts. Special provisions which seek to impose a higher than normal burden on one or other of the parties also often fail to provide the desired result.

Sections 4.4, 4.5 and 4.6 examined the way in which claims arise in practice. Disputes most often arise in respect of the adequacy and/or efficiency of resources and in particular labour and the availability and/or

adequacy of construction information. The adequacy and/or effectiveness of planning and management are significant factors in the cause and control of delay.

Section 4.7 considered the methods of analysis actually encountered in practice. This confirmed the expectation that the standard of analysis currently in use is particularly low.

Sections 4.8, 4.9 and 4.10 considered the practical problems encountered in producing the various schedules which might be required to demonstrate delay. These again reflected the difference in approach to both construction planning and the analysis of delay identified between the US and UK. The adequacy of record keeping is likely to be a key factor in determining the nature of the analysis which can be accomplished.

Sections 4.11 and 4.12 considered the form of analysis and presentation encountered in practice. This confirmed the expectation that the standard of presentation currently in use is particularly low.

Chapter 4 has reviewed current practice against the headings set out in Chapter 3. The analysis in Chapters 3 and 4 will be compared in Chapter 5.



## **Chapter 5 Current Practice v Theoretical Concepts**

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## **5.1     Introduction**

Chapter 5 will identify the particular areas in which current practice falls short of the theoretical concepts, general problems and key factors to consider in producing an analysis. The comparison between the theoretical concepts set out in Chapter 3 and current practice, as described in Chapter 4 was carried out manually. Copies of the corresponding Sections were read side by side and the areas of difference recorded in a document which formed Chapter 5. For clarity the full debate set out in Chapters 3 and 4 is not repeated here.

The section numbers of this Chapter follow those of Chapters 3. There being an additional section in Chapter 4 the corresponding section numbers are one number higher in Chapter 4 than in Chapters 3 or 5. Thus section 3.2 or 5.2 in Chapters 3 or 5 will correspond with section 4.3 in Chapter 4.

## **5.2     The Construction Contract and the Time for Completion**

So far as the contractual provisions as related to the time for completion are concerned current practice generally conforms well to the expectations of the parties. This is particularly so in respect of main contract provisions with the most likely area for dispute being in respect of phased or sectional completion provisions.

Provisions as related to sub-contracts are, as a result of contractors seeking to retain flexibility and reluctance to commit to fixed programmes, more likely to be uncertain and the cause of dispute.

Little effort is likely to be expended by employers or their consultants in considering a contractors programme for the works. Contractors are likely to have detailed discussions with individual sub-contractors regarding their programmes but may not put a very high priority on producing a fully integrated programme.

In practice the parties find adequate provisions within the contract to cover most eventualities and only need to rely on a limited number of fairly standard implied terms in support of their claims.

The analysis in Chapter 5 has identified that disputes most often, but not necessarily in any particular order of merit, arise in respect of:

- increase in the scope of work;
- the adequacy and/or efficiency of resources and in particular labour;
- the adequacy and/or effectiveness of planning and/or management;
- dates for the supply of particular information;
- responsibility for design and or provision of information to enable design to be completed;
- adequacy of design information for construction;
- errors in design.

A limited number of disputes arise in respect of matters concerning novel factual causes.

### **5.3 Claims by Employers Against Contractors**

In theory employers are protected against the effect of delay caused by the contractor and have a fairly clear remedy if completion is late. In practice, where a project is suffering from delay, employers are often frustrated by the lack of clear and unequivocal advice about the status of progress or a firm estimate of a revised completion date. Employers are also often surprised to find that their ability to influence performance is, in any event, limited and that because of the poor quality of progress information remedial action is difficult to define.



This situation will probably continue after project completion causing difficulty in establishing what action can and/or ought to be taken to recover any losses.

In practice intermediate completion dates may be difficult to enforce.

An employer forced to defend himself against a claim for delay may have to complete an extensive analysis to make good his defence and to maintain his entitlement to recover damages.

An employer forced to defend a claim may need to rely on documents directly available to him. In practice the analyst will need access to a wide range of documentation, not all of which will be provided voluntarily. This is particularly so in respect of the non-excusable non-compensable contractor generated causes. The analyst may see no obvious indication of the existence of such causes. A request for potential sources of such information may, legitimately, be resisted by the other party as being merely a 'fishing exercise'. Caution and ingenuity are, therefore, required in seeking this material.

#### **5.4 Contractors and Sub-Contractors Claims**

Contractual provisions are generally wide enough to include most causes of delay encountered in practice.

There may be debate about the right provisions under which to consider some claims, the employer and consultants often preferring neutral or excusable non-compensable causes and the contractor preferring excusable compensable causes.

In practice it is likely that a significant proportion of the claims against employers will result from deficiencies on the part of their consultants rather than by their own acts or omissions.

A contractor forced to defend a claim may need to rely on documents directly available to him.

In theory there is an extensive array of planning tools available to contractors to enable them to plan construction projects in adequate detail. However, this research has shown that, in practice, many contractors put insufficient effort into detailed planning and keep extremely poor records of actual performance.

In practice the provision of adequate resources is often a cause for concern.

### **5.5 Employers Claims Against Consultants**

Construction contracts put the employer in an onerous position regarding, in particular, the provision of information. In practice this information is actually provided by the employer's consultants. There is no back to back arrangement between the employer and his consultants in respect of the employer's obligations to the contractor.

The employer's obligations to the contractor are significantly higher than those of the consultant to the employer. The employer has an absolute obligation to the contractor whereas the obligation of the consultant will be to perform his duties to the standard expected of an ordinarily competent member of his profession.

Terms of engagement of construction consultants do not normally deal with the time for performance of the consultant's duties. Any general or implied terms would be measured against the performance of the ordinarily competent member of the profession and would not impose an absolute obligation.

Where a consultant has caused delay the employers damages may not be limited to the liquidated damages foregone but may extend to the employers actual loss over the delay period.

It is possible that any extension of time granted by the consultant may have been allowed in respect of neutral cause rather than in respect of a cause which would be of embarrassment to the consultant. In such cases a wide analysis of the cause(s) of delay will be required.

An employer seeking to make a claim may need to rely on the limited documents directly available to him.

## **5.6 The Method of Analysis**

There is no consensus amongst those technical and legal professionals involved in the production and prosecution of delay claims as to how such claims should be approached or the direction in which the approach ought to be developed.

Theoretically there are a number of different approaches available. In practice, however, many technical experts and/or lawyers appointed to advise in the production and prosecution of delay claims are not conversant with such choices. In any event there is no reference base, either for theoretical options or the practical solutions which have been attempted, to which such advisers can refer to identify the choices.

There is incompatibility between the theoretical concepts which can be deduced from available material and the understanding of those concepts by those producing and prosecuting delay claims. Consequently those theoretical concepts are not being deployed and developed in a structured way.

The 'Theory' of claims preparation requires that a detailed method of analysis is used but in practice parties seeking to pursue delay claims are



often reluctant to invest time and money in an extensive delay analysis. This tends to result in the assembly of ad hoc presentations with no particular methodology or the use of descriptive rather than analytical presentations. It is often difficult to persuade a potential litigant that his appreciation of the merits of his case may be flawed. Parties often want, or may be advised, to 'test the water' by way of a fairly general pleading before committing themselves to a wider analysis. The fuller analysis is then deferred until the issues are clarified or the analysis is required for the basis of an expert report.

The theoretical concepts of cause and effect are clearly understood. In practice, however, there remains a serious difficulty in demonstrating the link between cause and effect in the context of delay claims.

In theory the approach should consist of a factual analysis and a causal analysis. In practice these clear stages are not observed and consequently any presentation is likely to fail in clearly demonstrating the cause of any delaying events.

Any analysis which is done is extremely unlikely to have been carried out as an entirely objective attempt to allocate the cause of delay between the various participants. Most analyses are one sided with, at best, a cursory attempt to consider concurrent causes.

Any presentation is therefore unlikely to observe the important distinction between the factual analysis and the subsequent contractual analysis. The methodology may, in the event, be dictated by the picture the analyst is trying create.

## **5.7 The As-Achievable Plan**

To a large extent theory for the production of As-Achievable Plans is confounded by the poor status of construction programmes and the poor quality of planning generally. In practice little attempt is made to

establish an As-Achievable Plan or justify or verify the contractors original plan. Pickavance<sup>1</sup> concludes that the base programme needs to be checked to ensure that it is a satisfactory base for comparison.

Those defending delay claims are more appreciative of the benefit to be obtained from attacking the contractor's original plan.

Claims often proceed from an unsound base. In practice better As-Achievable Plans need to be produced. If the contractor's original plan is inadequate for the purpose a proper reconstruction should be carried out.

## **5.8 The As-Built Critical Path and As-Built Data**

Theory would see the As-Built critical path as an essential part of a planned verses actual comparison. In practice an As-Built critical path is never produced. In practice an As-Built chart is more likely to appear as a stand-alone presentation.

The theoretical requirements of an As-Built presentation are often inconsistent with the available project data.

Despite the voluminous records kept on construction sites there is often a dearth of concise and comprehensive data relating to progress.

Much skill is required to balance the opposing views portrayed in available documentation and in deciding which documents are most likely to represent the true situation.

The resulting analysis may, as a consequence, be open to easy criticism that it ignores certain key issues. The analysis may simply not be capable of explaining all of the actual events and delays.

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<sup>1</sup> Pickavance K, (1997) Delay and Disruption in Construction Contracts (Page 303), LLP.

## 5.9 The Analysis

In practice the quality of analyses finding their way into formal pleadings is generally poor<sup>2</sup>. It is a feature of litigation in the construction industry that the number of disputes upon which formal expert reports are exchanged is very small, most cases being compromised before that stage is reached. In the disputes analysed in this research only a small number of such reports were available and these have been poor.

The analyses failed to meet the principal evidential hurdle for any such analysis, which is to demonstrate what impact the matters complained of had on the project completion date. This failure is also reflected in the quality of the presentation material.

In practice time claims are often compromised before either side to the dispute has fully understood what the actual causes of delay were.

## 5.10 Presentation

Modern computer graphics provide the opportunity to produce descriptive and easily understood pictorial presentations of complex problems. Modern computer data handling capabilities provide the opportunity to handle, sort, manipulate, summarise and present vast quantities of numerical and factual data. In practice these facilities are being used without the proper analysis and understanding of the underlying facts.

Large quantities of computer generated data are often used in an attempt to intimidate an opponent. Project management software is used to produce graphics presentations rather than analytical proof of delay.

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<sup>2</sup> In recent years there have been the classic cases of *Wharf Properties*, *ICI v Bovis* and *Lloyds v Kitsons*. Although the courts are now less likely to take the same view of complaints about the adequacy of pleadings this is not because the quality of pleadings has necessarily improved.



The temptation to repeat all of the available data in the final presentation is a cause of confusion rather than an aid to understanding. A complex presentation will tend to confuse rather than persuade.

### **5.11 Summary of Chapter 5**

Chapter 5 has identified a significant number of general problems and particular areas in which current practice falls short of the legal principles and theoretical concepts and other key factors to consider:

- (a) Construction contracts do not place a high enough priority on the production and consideration of construction programmes;
- (b) Many contractors put insufficient effort into detailed planning;
- (c) A high proportion of delay claims relate to common complaints about, for example, the flow of construction information which could be avoided;
- (d) A limited number of delay claims relate to novel factual causes which probably could not be foreseen;
- (e) Where intermediate completion dates are required these are often not adequately covered in the contractual provisions;
- (f) Failure to deal with delays when they occur means that proper records are often not available when the analysis is actually carried out and that the employer is poorly advised about the likely completion date of the project;
- (g) Project records are often insufficient to support a full delay analysis;

- (h) In respect of the provision of information, an employer's obligation to the contractor will be significantly higher than the designer's obligation to the employer;
- (i) An employer may find itself in an invidious position faced with the need to defend a poorly particularised delay claim with inadequate records available to it;
- (j) A party may not have direct access to all the documents in the possession of its opponent;
- (k) There is no consensus amongst those technical and legal professionals involved in the production and prosecution of delay claims as to how such claims should be approached or the direction in which the approach ought to be developed;
- (l) Many technical experts and/or lawyers appointed to advise in the production and prosecution of delay claims are not conversant with the choices of approach available. There is no reference base, either for theoretical options or the practical solutions which have been attempted;
- (m) There is incompatibility between the theoretical concepts which can be deduced from available material and the understanding of those concepts by those producing and prosecuting delay claims. Consequently those theoretical concepts are not being deployed and developed in a structured way;
- (n) Parties seeking to pursue delay claims are often reluctant to invest time and money in an extensive delay analysis. This tends to result in the assembly of ad hoc presentations with no particular methodology or the use of descriptive rather than analytical presentations. The fuller analysis is then deferred until

the issues are clarified or the analysis is required for the basis of an expert report;

- (o) As-Achievable plans are often poor because the underlying original construction plan is poor. The result may be an analysis which is easily open to attack;
- (p) As-Built plans are often poor because there are insufficient records to produce a complete As-Built picture. The result may be an analysis which is easily open to attack;
- (q) There is a serious difficulty in demonstrating the link between cause and effect in the context of delay claims. Presentations fail in clearly demonstrating the cause of any delaying events;
- (r) The analysis is seldom an entirely objective attempt to allocate the cause of delay between the various participants. Most analyses are one sided with, at best, a cursory attempt to consider concurrent causes;
- (s) Presentations often fail to observe the important distinction between the factual analysis and the subsequent contractual analysis. The methodology may, in the event, be dictated by the picture the analyst is trying create;
- (t) Presentations are often poor. A clear demonstration of the effect of each delay is required. This is often confounded by over complex presentations. There is a temptation to try and include or reflect all the available data rather than only that which is relevant.

These problems fall into one or more of the following three categories:



- (a) Those which may be (the) cause(s) of delay and contribute to the need to produce an analysis;
- (b) Those that the analyst must recognise may affect his choice of analysis method; and
- (c) Those which the method of analysis must be capable of accommodating.

None of the problems encountered in practice would lead to the need to amend the principles of analysis described in Chapter 3. Chapter 4 did, however, identify difficulties of application which need to be resolved in any analysis.

Chapter 6 will develop a proposal for an approach to delay analysis which accommodates the problems identified in Chapter 5.

## **Chapter 6 Proposal**

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## **6.1     Introduction**

Chapter 6 will develop a proposal for an approach to delay analysis and the proof of time entitlement which satisfies UK legal precedents and practical constraints, using US practice and legal precedents as a model. The research has identified three key requirements:

- (a)     compliance with legal principles<sup>1</sup>;
- (b)     compliance with theoretical concepts<sup>2</sup>;
- (c)     incorporation of the points arising out of the rationalisation of the practical problems of application<sup>3</sup>.

This Chapter is in two parts. The first part is a re-statement of the key requirements. The key requirements have been identified from a wide variety of sources and are developed in Chapters 2, 3, 4, and 5. For that reason it has been considered appropriate to collect and distil all those matters together in the first half of this Chapter. The analysis of those matters will be carried out in Sections 6.2, 6.3 and 6.4. No such collection and distillation is currently available. Section 6.5 will contain the proposal by way of the description of a process of analysis which will comply with all of the key requirements. The breadth of this Chapter is dictated by the need to develop the proposal from first principles as there is no previous proposal available which covers the complete scope of such a process.

Section 6.2 will restate and summarise the legal principles and their application to the formulation of an approach to delay analysis.

Section 6.3 will restate and summarise the theoretical concepts and their application to the formulation of an approach to delay analysis.

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<sup>1</sup> See in particular Sections 2.4, 2.5 and 3.2.

<sup>2</sup> See in particular Sections 2.2, 2.3 and 3.6.

<sup>3</sup> Identified in Chapter 4 and distilled in Chapter 5



Section 6.4 will review the practical problems which are distilled in Chapter 5 and identify their potential impact on the formulation of the approach to delay analysis. The exploration and analysis of the practical problems is carried out in Appendix 4 hereto. Section 6.4 will summarise the points arising out of that exploration and analysis.

Section 6.5 will describe the proposed process for completing a time analysis of a construction project which incorporates the legal principles and the theoretical concepts and accommodates the practical problems of application.

## **6.2 Summary of the Legal Principles**

The analysis in Chapters 2 and 3 identified a number of legal principles.

To succeed with a delay claim it is necessary to:

- (a) establish that a delaying event has occurred;
- (b) establish that the delaying event is:
  - (i) a matter which gives rise to an entitlement to an extension of time under the contract; or
  - (ii) a breach of contract;
- (c) establish that the delaying event caused delay to the project and to the completion date;
- (d) establish the extent of the delay.

The final presentation of the delay analysis will provide an answer to all these matters. Items (a) and (b) are matters of fact and the Courts have identified the nature and extent of the evidence which is required to

establish an entitlement to additional time. Schedule Impact Analysis is primarily required to provide the answer to items (c) and (d).

The Schedule Impact Analysis is required to meet the following evidential burdens:

- (a) establish what the project duration and completion date would have been had the delaying event not occurred.

There is no evidential presumption that any tender, contract or other programme should form the basis of any claim for delay<sup>4</sup>. Thus it is essential to establish, by objective evidence, what the completion date would have been had the delaying event not occurred;

- (b) establish the critical path which corresponds with the project duration and completion date;
- (c) demonstrate the period by which the critical path was extended by each delaying event.

The presentation of time claims on a global basis is not supported by the cases which are often quoted in support of that general proposition<sup>5</sup>. The Courts have shown a preference for a detailed, logical analysis over the impressionistic approach<sup>6</sup>. Thus the need for an analytical approach is established;

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<sup>4</sup> UK law takes the view that a contractor, or sub contractor is not entitled to rely on any programme which is not a contract document. See for example the decision in *Kitson Sheet Metal Ltd. and Ano. v. Matthew Hall Mechanical & Electrical* where HH Judge John Newy QC declined to construe the contract in a way so as to incorporate a programme. Similarly a contractor or sub-contractor is not obliged to follow any particular programme. The decision in *GLC v. Cleveland Bridge* as applied in *Pigott Foundations v. Shepherd Construction* confirms that the contractor, or sub contractor has a wide freedom to plan and execute his work to suit his own convenience.

<sup>5</sup> The cases of *Crosby* and *Merton* are often quoted in support of the use of global claims. Both cases involved the apportionment of loss and expense or additional cost. There is no suggestion that in either case the breaches themselves were not properly pleaded.

<sup>6</sup> The decisions in *John Barker v. Portman Hotel* and *McAlpine v. McDermott* emphasise the need for an analytical approach to the investigation and determination of extension of time.

- (d) demonstrate the total period by which the critical path was extended by all delaying events;
- (e) resolve issues of concurrency.

It follows from items (b), (c) and (d) that a critical path analysis is required. Items (a) and (b) are resolved by the production of an As-Achievable Chart. Items (c) and (d) are resolved by the production of an As-Impacted Chart. Item (e), the matter of concurrency, is resolved by the production of the employer and contractor responsible As-Impacted Charts and the formula used to calculate the excusable and excusable, compensable delays<sup>7</sup>.

### 6.3 Summary of the Theoretical Concepts

The work in Chapter 2 identified that the analyst has a choice of approach. The choice is between a delay analysis which is:

- (a) prospective<sup>8</sup>;
- (b) contemporaneous<sup>9</sup>; or
- (c) retrospective<sup>10</sup>.

These approaches are identified and analysed in detail in Chapter 2, that detail is not repeated here. Each approach is capable of establishing the impact of a delaying event:

- (a) The prospective approach has a lesser probative value than

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<sup>7</sup> See further in respect of theoretical concepts below for a description of the approach to concurrency.

<sup>8</sup> Prospective analysis techniques include the method described elsewhere as the As-Planned method.

<sup>9</sup> The Snapshot and Update-Impact techniques are examples of contemporaneous pricing methods.

<sup>10</sup> Retrospective methods include the As-Built, But-For and other forms of analysis which are based on actual performance.



other approaches<sup>11</sup>. The prospective approach may be found in use in circumstances:

- (i) where an Employer is faced with defending a poorly particularised delay claim;
  - (ii) where an answer is required in advance of, or in the absence of disclosure of relevant information;
  - (iii) where there is no as-built performance data available;
  - (iv) to demonstrate time entitlement beyond the actual completion date where a contractor is seeking to establish an entitlement to acceleration costs
  - (v) where there are severe time or financial constraints;
  - (vi) where an early indication of the potential impact of delaying events is required.
- (b) Although the contemporaneous approach is widely used in the US it is not appropriate for use in the UK:
- (i) it is inconsistent with the approach to construction project planning found in the UK;
  - (ii) it is inconsistent with the extent of progress records and other status information available on construction projects in the UK;
  - (iii) unless implemented during performance, reconstruction after the event would be prohibitively expensive.

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<sup>11</sup> This is mainly because this approach does not take account of actual performance. The results of such an analysis may produce a completion date beyond the actual date for completion or fail to provide an explanation for the whole of the delay. Notwithstanding this the approach was approved in *John Barker v. Portman Hotel*.

- (c) The retrospective approach is identified as being the most appropriate:
  - (i) it is the nearest available alternative to the most widely used method in current use<sup>12</sup>;
  - (ii) it is able to provide a resolved view of what would have happened had the delaying event not occurred;
  - (iii) it can properly take account of all alternative causes.

The analysis should account for all differences between the planned and actual performance.

The calculation of delay must be made by reference to the impact on the completion date not to any intermediate date or activity<sup>13</sup>.

There are three types of delay:

- (a) excusable delay. Delay for which the contractor is entitled to an extension of time and relief from liquidated damages but no compensation. Usually relates to shared risks;
- (b) excusable, compensable delay. Delay for which the contractor is entitled to an extension of time, relief from liquidated damages and compensation. Usually relates to risks accepted by and fault on the part of the Employer;
- (c) culpable delay. There is no entitlement to either an extension of time or compensation; the Contractor pays compensation to the Employer, usually in the form of liquidated damages (sometimes referred to as non-excusable, non-compensable

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<sup>12</sup> Identified as being the As-Built form of analysis.

<sup>13</sup> As a matter of principle any entitlement to delay must be based on the impact to the project completion date and not a comparison between planned and actual completion dates in respect of individual activities. (Callahan and Hohns and Wickwire and Smith).

delay). Relates to risks accepted by, and fault on the part of, the contractor.

The calculation of delay entitlement must take account of the matter of concurrency. Although this proposal uses a 'netting off' approach to the resolution of concurrency, regard must be had to any contractual provisions<sup>14</sup>. If for example the extension of time is to be calculated by ignoring concurrent delay by the contractor but the period for the payment of loss and/or expense should not, then two calculations would be required<sup>15</sup>. Delay entitlement would be calculated as follows:

- (a) entitlement to extension of time is calculated by taking the difference between:
  - (i) the completion date calculated on the As-Impacted Chart including Employer responsible delays (including all excusable delays), or the actual completion date, whichever is the earlier; and
  - (ii) the original contract completion date, or the completion date calculated on the As-Achievable Chart, whichever is the later.

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<sup>14</sup> It is contended that a method of analysis which incorporates a practical and common sense approach to the resolution of concurrency is required. It is further contended that any approach which seeks to review, match and analyse individual delaying events in isolation is doomed to failure through the simple weight of complexity. An approach which takes a broad, project wide, view of concurrency and which can bring a proper balance to the notions of fairness, weight and/or dominance and common sense is one which will, ultimately, prevail.

In dealing with concurrency it is concluded that where there are a number of delays caused by each party and those delays are of approximately equal efficacy the overall effect of the aggregate of those delays may be 'netted off'. Discounting for concurrency will be achieved by an overall adjustment based on the total amount of delay caused by each party.

<sup>15</sup> In many cases the approach to concurrency can be derived from the contractual provisions. Thus, by way of example, the wording of the JCT 80 Standard Form of Contract, arguably, allows the contractor an extension of time where a delaying event has occurred whether there has been concurrent delay by the contractor or not. Application of the separate provisions relating to compensation, which do not exclude the concept of concurrent causes, is likely to result in the contractor being compensated for a lesser period.



- (b) the period of delay entitlement for loss and/or expense is calculated by taking any positive difference between:
  - (i) the completion date calculated on the As-Impacted chart including Employer responsible delays (including only excusable, compensable delays)<sup>16</sup>, or the actual completion date, whichever is the earlier; and
  - (ii) the original contract completion date or the completion date calculated on the As-Impacted chart including contractor responsible delays, whichever is the later.
- (c) The period of culpable delay is the difference between the overall period of delay and the excusable period of delay.

#### **6.4 The Problems Found in Practice and their Solutions**

The problems of application found in practice are distilled in Chapter 5 and can be summarised as follows:

- (a) Construction contracts do not place a high enough priority on the production and consideration of construction programmes;
- (b) Many contractors put insufficient effort into detailed planning;
- (c) A high proportion of delay claims relate to common complaints about, for example, the flow of construction information which could be avoided;
- (d) A limited number of delay claims relate to novel factual causes which probably could not be foreseen;

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<sup>16</sup> If the prospective approach is used it is possible that the completion date calculated on the As-Adjusted Chart including employer responsible delays may be later than the actual completion date. If this is the case the contractor may be entitled to recover acceleration costs.

- (e) Where intermediate completion dates are required these are often not adequately covered in the contractual provisions;
- (f) Failure to deal with delays when they occur means that proper records are often not available when the analysis is actually carried out and that the Employer is poorly advised about the likely completion date of the project;
- (g) Project records are often insufficient to support a full delay analysis;
- (h) In respect of the provision of information, an Employer's obligation to the contractor will be significantly higher than the designer's obligation to the Employer;
- (i) An Employer may find itself in an invidious position faced with the need to defend a poorly particularised delay claim with inadequate records available to it;
- (j) A party may not have direct access to all the documents in the possession of its opponent;
- (k) There is no consensus amongst those technical and legal professionals involved in the production and prosecution of delay claims as to how such claims should be approached or the direction in which the approach ought to be developed;
- (l) Many technical experts and/or lawyers appointed to advise in the production and prosecution of delay claims are not conversant with the choices of approach available. There is no reference base, either for theoretical options or the practical solutions which have been attempted;
- (m) There is incompatibility between the theoretical concepts which can be deduced from available material and the understanding of those concepts by those producing and prosecuting delay claims.

Consequently those theoretical concepts are not being deployed and developed in a structured way;

- (n) Parties seeking to pursue delay claims are often reluctant to invest time and money in an extensive delay analysis. This tends to result in the assembly of ad hoc presentations with no particular methodology or the use of descriptive rather than analytical presentations. The fuller analysis is then deferred until the issues are clarified or the analysis is required for the basis of an expert report;
- (o) As-Achievable Charts are often poor because the underlying original construction plan is poor. The result may be an analysis which is easily open to attack;
- (p) As-Built Charts are often poor because there are insufficient records to produce a complete As-Built picture. The result may be an analysis which is easily open to attack;
- (q) There is a serious difficulty in demonstrating the link between cause and effect in the context of delay claims. Presentations fail in clearly demonstrating the cause of any delaying events;
- (r) The analysis is seldom an entirely objective attempt to allocate the cause of delay between the various participants. Most analyses are one sided with, at best, a cursory attempt to consider concurrent causes;
- (s) Presentations often fail to observe the important distinction between the factual analysis and the subsequent contractual analysis. The methodology may, in the event, be dictated by the picture the analyst is trying create;
- (t) Presentations are often poor. A clear demonstration of the effect of each delay is required. This is often confounded by over complex presentations. There is a temptation to try and include



or reflect all the available data rather than only that which is relevant.

The problems and their solutions are analysed in Appendix 4 hereto. Appendix 4 includes two tables:

- (a) Table 1 Analysis of Problems and Their Impacts;
- (b) Table 2 Analysis of Impacts and Their Accommodation.

Table 1 lists the problems and explores their nature in the context of the three types of problem identified in Section 5.11. Using that information solutions to the individual problems are developed and their impact on the process or method of analysis is identified.

Table 2 rationalises the solutions and their impacts, sorts the results into the order in which they are likely to be encountered/need to be resolved during the process of analysis and removes the duplicates. The table also identifies the way in which the results are accommodated in the proposed analysis process.

The following notes are a distilled version of the data contained in Table 2 of the Appendix. The notes below in bold are the potential impacts on the process or method of analysis and the notes in italics are the details of how the impacts are accommodated in the proposal. The sub-paragraph numbering corresponds with the numbering in Table 2:

- (a) **There is a need to understand what information is available before confirming the approach:**
  - (i) **The nature of the approach may be limited to prospective analysis if there is no contemporaneous performance data available.**

- (ii) **There is a need to consider timing of analysis in relation to availability of remote party documents.**

*The proposed process requires the analyst to identify what information is available before confirming the method of analysis.*

- (b) **The method of analysis must be suitable for the nature of the particular project and its delaying factors before selecting approach:**

- (i) **The nature of the problem will dictate level of detail used in the analysis and/or use of time windows;**
- (ii) **Separate critical paths will need separate analysis;**
- (iii) **Separate analysis may be required for each party.**

*Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming method of analysis:*

- *Proposed method will facilitate the use of layered analysis or analysis within time windows;*
- *Proposed method will allow the use of parallel analyses;*
- *Separate As-Impacted plans can be produced to reflect the liability of each party.*

- (c) **Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.**

*Proposed method is not limited to use with any particular project management software package.*

- (d) Choice of approach may be limited to a prospective analysis if time and/or financial constraints are paramount.**

*Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.*

- (e) The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.**

*Proposed method requires verification of the original plan.*

- (f) Where a large amount of complex data is involved the analysis may have to be layered (use of a number of levels of analysis) or the project will have to be analysed in a number of discrete time periods (window analysis).**

*Proposed method will facilitate the use of layered analysis or analysis within time windows.*

- (g) The method of analysis must identify all delaying factors.**

*Proposed method requires the identification and inclusion of all delaying events.*

- (h) The contractual analysis must rationalise the delaying factors and identify those which affect the completion date and the party responsible.**



*Proposed method requires the identification and inclusion of all delaying events and provides the facility to separate delays caused by different parties.*

- (i) Selected approach must provide a clear connection between the alleged breach of contract and the impact on completion.**

*Proposed process will provide proper identification of the causal link.*

- (j) Selected approach must provide a clear and uncomplicated presentation.**

*Proposed process will lead to the production of a clear and uncomplicated presentation.*

## **6.5 The Proposed Approach**

In order to produce an analysis which will fulfil the three key requirements the analyst should work through the following stages:

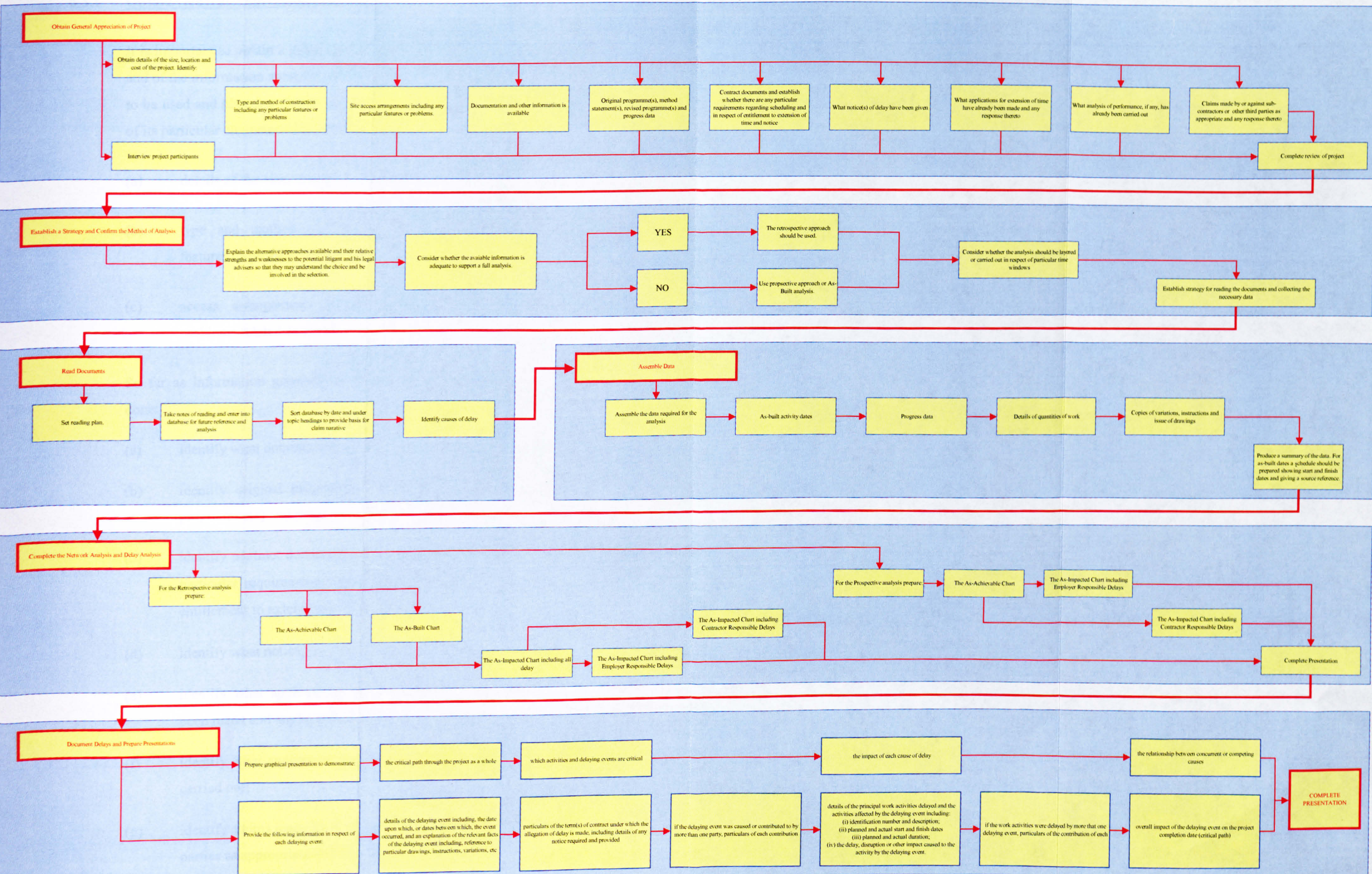
- (a) obtain general appreciation of project;**
- (b) establish a strategy and confirm the method of analysis;**
- (c) read documents;**
- (d) assemble data;**
- (e) complete the network analysis and the delay analysis;**
- (f) document delays and prepare presentation.**

A flow chart that sets out the proposed process of delay analysis follows as Figure 1. A full description of each stage of the analysis follows the flowchart.



Figure 1

## The Process of Delay Analysis





### **6.5.1 Obtain General Appreciation of Project**

It is important to obtain a good appreciation of the project to be analysed and of the information available before confirming the method of analysis to be used and planning further work. An appreciation of the project and of its particular characteristics should include:

- (a) details of the size, location and cost of the project;
- (b) type and method of construction including any particular features or problems;
- (c) access arrangements including any particular features or problems related to the site.

So far as information generally is concerned the following should be done:

- (a) identify what documentation and other information is available;
- (b) identify original programme(s), method statement(s), revised programme(s) and progress data;
- (c) identify contract documents and establish whether there are any particular requirements regarding scheduling and in respect of entitlement to extension of time and notice;
- (d) identify what notice(s) of delay have been given;
- (e) identify what applications for extension of time have already been made and any response thereto;
- (f) identify what analysis of performance, if any, has already been carried out;
- (g) identify claims made by or against sub-contractors or other third parties as appropriate and any response thereto;



(h) interview project participants.

It is important to understand what has already been done and what material is available. Obviously only an impression of the particular difficulties encountered on the project can be obtained at this stage. An analyst would be unwise to commit himself to either a timetable or a budget for the work without obtaining this general appreciation.

#### **6.5.2 Establish a Strategy and Confirm the Method of Analysis**

What is required is to confirm which approach will be used and establish the strategy for reading the documents and collecting the necessary data.

On small projects this may only take a few hours. On a major project it may take a week or more to complete this appraisal. Some analysts will carry out the initial appraisal and produce a brief report setting their initial impression of the merits of the case and proposals for further work for a lump sum fee.

The available information should be reviewed to ensure that it will be adequate to support a full analysis. Unless there are overriding reasons for using some other form of analysis the retrospective approach should be used<sup>17</sup>. At this stage the analyst should consider whether the analysis should be layered or carried out in respect of particular time windows.

The analyst appointed to advise on the production and prosecution of delay claims should, in any event, explain the alternative approaches available and their relative strengths and weaknesses to the potential litigant and his legal advisers so that they may understand the choice and be involved in the selection.

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<sup>17</sup> The choice of approach will, to some extent, be informed by the data available. It would be no good for example making a total commitment to the contemporaneous approach if there was no regular progress data available. It would be impossible to complete either a contemporaneous or retrospective analysis without as-built data.

### 6.5.3 Read Documents

Here the aim is to collect together the factual material required to explain and support the complaints.

On a large construction project the amount of documentation will be enormous and it would not be possible to read everything. It is therefore necessary to be selective about which documents are read and to carefully plan the reading.

The extent of reading will be dictated by the time available, how well the causes of delay have been identified during construction and the adequacy of record keeping generally. Time ought not to be, but often is, a limiting factor. The potential litigant should be discouraged from setting too tight a budget or timescale but these are often commercial realities. As to the extent to which it is safe to concentrate on the delay topics which have already been identified this is a matter for the judgement of the analyst. Again the potential litigant should be discouraged from attempting to limit the scope of enquiry of the analyst but, again, this is often a commercial reality.

As documents are read notes should be taken of any important points and matters of detail. The notes should be entered into a database<sup>18</sup> together with details of the document reference, nature of the document, date, who generated the document, who it was sent to, etc. As the reading progresses a list of topics will develop and the various notes should be allocated or cross referenced to the various topics. It is not necessary to slavishly copy out the text of every important document but the aim should be to enable any subsequent reader of the note to understand the point without having to refer to the actual document. The database provides the facility to make verbatim quotes from the documents and a

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<sup>18</sup> The author first used a database system to analyse project complaints in 1989. Since 1989 a sophisticated database system has been developed by Mr Chris Ennis which is used on all forensic work carried out by the author's company. The notes which form the basis of the work in Chapters 2, 3 and 4 of this thesis were collected and analysed in this way.

separate field for any commentary by the reader. It is important that these two are not confused.

With developments in imaging technology the scanning of whole documents has become viable. There remains however the need to be selective about the documents entered. It is still difficult to scan documents in a way which enables them to be directly interrogated and searching of documents still tends to rely on the separately data-based notes of key words dates etc. Unfortunately the ability to scan-in huge quantities of data may create a less rather than more accessible data set.

Once notes are stored in the database they can be easily retrieved, sorted and displayed. Date sorted notes under topic headings provide an ideal base from which to develop descriptive narrative for the various delay topics.

#### **6.5.4 Assemble Data**

The aim is to collect together the data required to carry out the various analyses which are required.

As-built activity dates, progress data, information about quantities of work, variations, instructions and issue of drawings, etc, dates of key events, weather records and other such data will be required. It is important for the analyst to identify the best source of such data but its collection can be delegated to junior staff or may be undertaken by the potential litigants own staff. It obviously saves time if the collection of data can proceed in parallel with the general reading.

For as-built dates a schedule should be prepared showing start and finish dates and giving a source reference<sup>19</sup>. Where there are a number of competing dates available for a particular activity or event the

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<sup>19</sup> Some planning software packages allow this to be included in the same data files as the activity data, or in data files linked to the activity data files. OpenPlan, for example, is based on a database program and additional fields can be added to include information on actual start and finish dates.



alternatives should be noted and a reason given for the selection finally made.

Overall start and finish dates may not be sufficient on their own. Where there are periods of low productivity this should be noted. This is often best achieved by noting the percentage of the work completed each week. Some planning software packages allow this data to be printed out on the bar chart.

Progress data is often difficult to summarise and is often not comprehensive. It is important to take a view on what is available before committing to a method of analysis or the level of detail in which it is intended to work. The availability of such data may restrict the selection.

#### **6.5.5 Network Analysis and Delay Analysis**

This stage will produce the Schedule Impact Analysis.

For the retrospective analysis it will be necessary to produce five network charts:

- (a) The As-Achievable Chart;
- (b) The As-Built Chart;
- (c) The As-Impacted Chart including all delays;
- (d) The As-Impacted Chart including Employer Responsible Delays;
- (e) The As-Impacted Chart including Contractor Responsible Delays.

The As-Achievable Chart is a programme which calculates the completion date which would have been achievable absent delays caused by either party:

- (a) An As-Achievable Chart will need to acknowledge many things and may not correspond either with the contractual completion date or the contractors original plan;
- (b) An As-Achievable Chart may, subject to proof of adequacy, be based on the contractors original plan or on a plan produced after the event;
- (c) The As-Achievable Chart should be a network which comprises finish to start relationships, without any fixed restraining dates and which shows the critical path through the project.

The As-Built Chart is assembled using the as-built data:

- (a) The As-Built Chart will follow as closely as possible the logic and sequence of the As-Achievable Chart:
- (b) The As-Built Chart will show how the project was actually constructed and demonstrate the total time taken in fact and locate the actual critical path;
- (c) In order to make a valid comparison it is essential that the as-built data is compatible with the As-Achievable Chart. This can only be achieved by ensuring that the As-Achievable Chart anticipates the quality and extent of As-Built data available. Any variations between the As-Achievable and the As-Built will have to be identified and explained as part of the As-Impacted Chart;
- (d) As a basic minimum, start and finish dates for each activity are required.
- (e) The As-Built Chart should, as far as possible, be a network which comprises finish to start relationships, without any fixed restraining dates and which shows the critical path through the project.

The As-Impacted Chart including all delays. This Chart will be derived from the As-Built Chart as follows:

- (a) if not already completed as part of the As-Built Chart:
  - (i) detail points where the As-Built conforms with the As-Achievable;
  - (ii) detail points of variance;
  - (iii) explain actual durations and sequences where at variance with the plan;
  - (iv) locate the actual critical path.
- (b) adjusting the activity durations and/or adding additional activities and logical relationships in order to explain all of the differences identified in (a)<sup>20</sup>.
- (c) Provide an explanation in respect of each of the differences identified on the As-Impacted Chart.
- (d) The analysis is required to identify:
  - (i) cause and nature of the delay, including whether the delay is continuous/intermittent;
  - (ii) activities affected by delay;
  - (iii) the time span of each delay;
  - (iv) changes in sequence;
  - (v) impact on completion date.

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<sup>20</sup> It is important, in considering the delays and their causes during the analysis process, that the analyst take a view as to which delays are real and effective as opposed to those which are simply progress related events or immaterial matters which can be discounted as effective causes of delay.



- (e) Each delay can be colour coded and fully documented and explained with appropriate references to contract documents and project records.

The As-Impacted Chart will be used to prepare the Employer/Contractor Responsible As-Impacted Charts.

The Employer Responsible As-Impacted Chart will be produced by removing all delays other than those for which the employer is responsible. Depending on the contractual provisions relating to concurrency more than one chart may be required.

The Contractor Responsible As-Impacted Chart will be produced by removing all delays other than those for which the contractor is responsible.

Once the various charts are completed the entitlement to excusable and excusable, compensable delay are calculated.

Should it be required a prospective analysis will normally comprise three network charts:

- (a) The As-Achievable Chart;
- (b) The As-Impacted Chart including Employer Responsible Delays;
- (c) The As-Impacted Chart including Contractor Responsible Delays.

The As-Achievable Chart is produced in the same way as for the retrospective analysis.

The two As-Impacted Charts are produced by taking the As-Achievable Chart and incorporating into it additional activities and logic constraints

to represent the delaying events. The As-Impacted including Employer Responsible Chart will incorporate those delaying events which are the responsibility of the employer. The As-Impacted including Contractor Responsible Chart will incorporate those delaying events which are the responsibility of the contractor.

#### **6.5.6 Document Delays and Prepare Presentation**

The presentation will take the form of a report and consist of a summary chart or charts which graphically demonstrate the delays and their impact and a narrative which documents the individual delays and explains the process of analysis undertaken. The charts and their explanation produced as part of the Schedule Impact Analysis will be appended to the report.

Although the analysis may be based upon a computer network planning system the results will likely best be graphically presented in bar chart form. The bar charts should be supported by a data listing of the activity data which identifies the logical relationships between activities.

The graphical presentation must be capable of demonstrating:

- (a) the critical path through the project as a whole;
- (b) which activities and delaying events are critical;
- (c) the impact of each cause of delay;
- (d) the relationship between concurrent or competing causes.

The method of producing the summary chart or charts will be dictated by the method and extent of analysis. Where the analysis is simple the As-Impacted Charts may be sufficient for the final presentation.

If the As-Impacted Charts are complicated and contain a lot of supporting data it may be preferable to abstract the relevant data to provide a clear

and concise summary chart which includes the key causes of delay. This should not however be used as an excuse to manipulate the results.

The narrative should fulfil evidential expectations of the Courts. Each delaying event should be documented to provide the following information:

- (a) details of the delaying event including, the date upon which, or dates between which, the event occurred, and an explanation of the relevant facts of the delaying event including, reference to particular drawings, instructions, variations, etc;
- (b) particulars of the term(s) of contract under which the allegation of delay is made, including details of any notice required and provided;
- (c) if the delaying event was caused or contributed to by more than one party, particulars of each contribution;
- (d) details of the principal work activities delayed and the activities affected by the delaying event including:
  - (i) identification number and description;
  - (ii) planned and actual start and finish dates
  - (iii) planned and actual duration;
  - (iv) the delay, disruption or other impact caused to the activity by the delaying event.
- (e) if the work activities were delayed by more than one delaying event, particulars of the contribution of each;
- (f) overall impact of the delaying event on the project completion date (critical path).



## **6.6 Summary**

Section 6.2 summarised the legal principles set out in Chapters 2 and 3 and their application to the formulation of the analysis method.

Section 6.3 summarised the theoretical concepts set out in Chapters 2 and 3 and their application to the formulation of an analysis methodology.

Section 6.4 and Appendix 4 explored and analysed the solutions to the practical problems distilled in Chapter 5. The application of the solutions to the formulation of an analysis methodology was also analysed.

Section 6.5 sets out the proposed process for completing a time analysis of a construction project.

Chapter 7 will summarise the findings of the research and include the validation of the proposed process. Chapter 7 will also set out recommendations for further research.

## **Chapter 7 Conclusions and Recommendations**

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## **7.1 Introduction**

Chapter 7 will include the validation exercise which is required for testing the proposal. The validation procedure will be explained and the responses analysed. This Chapter will also summarise the conclusions of the research and define its limitations and set out recommendations for further research.

## **7.2 Validation**

Validation has been a matter of concern throughout the process of defining the proposed approach. In defining the approach care was taken to ensure that each of the key requirements were incorporated in the proposals. Full validation, however, requires that there is some external, objective, test of the adequacy of the proposed approach.

The objectives of the validation were to ensure that:

- (a) the proposed approach fulfils the legal, theoretical and practical requirements;
- (b) the proposed approach fulfils the hypothesis and in particular that the proposed approach is effective and of practical application and will improve the efficiency of the preparation and prosecution of delay claims.

The first objective is achieved through the analysis carried out in Appendix 5 hereto. The analysis confirms that all of the requirements of the analysis set out in Sections 2, 3 and 4 of Chapter 6 are reflected in the proposal set out in Section 5.

The second objective is achieved through a process of expert review and observation in practice. Details of the process of expert review and in



particular the selection of experts, construction of the enquiry and the analysis of the results are set out below.

### **7.2.1 Selection of Experts**

To fulfil the hypothesis the proposed approach must be effective, conceptually sound and of practical application. To be effective it must fulfil the requirements set out in Sections 6.2, 6.3 and 6.4 and be acceptable to those who will carry out the analysis and those who must present and prosecute the results. The experts were therefore chosen from the following disciplines:

- (a) Construction Barristers;
- (b) Solicitors specialising in construction disputes; and
- (c) Technical specialists practising in the field of delay analysis.

The respondents chosen were senior specialists in the field of construction dispute resolution.

To obtain a reasonable sample at least six responses are required, preferably with two in each category. In order to achieve this four individuals were canvassed in each category.

### **7.2.2 Construction of the Enquiry**

The enquiry was intended to obtain an overall impression of the proposal rather than the verification of any specific point. This approach has to be adopted because, for the reasons explained in Chapter 6, the proposal is so broad. The enquiry was therefore structured in a way which required the respondent to read the proposal and express an opinion on the four main sections of Chapter 6:

- (a) the legal principles;

- (b) the theoretical concepts;
- (c) the impact of problems found in practice;
- (d) the adequacy of the proposed approach,

alternatively, the respondents were asked to give their overall impression of the proposal.

A letter of enquiry as set out in Appendix 6 hereto was sent to each respondent together with a copy of Chapter 6 and a brief questionnaire. The questionnaire and the proposal are also set out in Appendix 6.

### **7.2.3 The Responses**

Seven responses were received. The respondents were as follows:

- (a) Leading construction QC. Regular contributor to the construction press.
- (b) Leading construction barrister. Regular contributor to the construction press, including several articles in respect of delay analysis.
- (c) Senior partner in firm of solicitors specialising in contentious construction work. Author of a book relating to construction claims with particular emphasis on retrospective delay analysis.
- (d) Solicitor, head of construction in a leading firm of solicitors in Scotland.
- (e) Schedule Impact Analyst, an engineer by profession practising in USA and specialising in the analysis of delay claims.

- (f) Schedule Impact Analyst, a construction planner by profession specialising in the analysis of delay claims.
- (g) Claims Consultant, a quantity surveyor by profession specialising in the analysis of construction claims, including delay analysis, loss and expense and defects claims.

#### 7.2.4 The Results

All seven responses were positive.

There were four questionnaires returned and six of the seven respondents provided detailed comments on the text. A questionnaire, in respect of respondent (d) was compiled from the detailed comments provided on the text.

The overall response from respondent (b) was that the work '*was very thorough and attracts little criticism*'. The specific criticisms by this respondent relate to the prospect of widening the work to include delay caused by disruption and the question of the relationship between sub-contract claims and main contract claims:

- (a) the matter of delay caused by disruption is considered in Chapter 4 and not therefore specifically addressed in the proposal. The proposal requires that these matters be considered in that all matters of delay should be identified;
- (b) although the possibility that sub-contractors delay claims may not be back-to-back with main contract delay claims is not explained in the proposal this is considered in Chapter 4. The proposal can be applied to either sub-contract or main contract claims, but may not be capable of dealing with both simultaneously because:



- (i) different contractual provisions may apply;
- (ii) critical delay to the sub-contract may not cause critical delay to the main contract.

The responses to the questionnaires were as follows:

<u>Respondent</u>	<u>Question</u>			
	1	2	3	4
(a)	Adequate	Adequate	No	Adequate
(b)	Not Returned			
(c)	Adequate	Comprehensive	Yes	Adequate
(d)*	Adequate	Adequate	No	Adequate
(e)	Comprehensive	Comprehensive	No	Comprehensive
(f)	Adequate	Adequate	No	Comprehensive
(g)	Adequate	Comprehensive	No	Adequate

\* Derived from the detailed comments provided in the text.

The detailed responses to each of the questions and the more in respect of them are analysed further below. References are to the copy of the proposal included in Appendix 6.

### 7.2.5 Question 1 - The Legal Principles

Although all of the respondents considered that the legal principles were adequately explained, one suggested that there were further matters of principle which ought to be included and one took issue with the definition of the project duration:

- (a) The further matters of principle suggested were that there should be reference to a number of recent cases and that there should be some reference to mitigation.
- (i) Of the particular cases mentioned all have been reviewed in Chapter 2 and with the exception of **Balfour and Beatty v Chestermount** are already reflected in Chapter 6. **Balfour and Beatty v Chestermount** is analysed in Chapter 2. The following note should have been added after paragraph 3.4. 'A non-culpable delay occurring in an otherwise culpable delay should be measured on a net rather than a gross basis.'
- (ii) The practical aspects of mitigation are dealt with in Chapter 2 and are accommodated in the proposal.
- (iii) So far as the legal concept of mitigation is concerned if it were appropriate for this to be included then it might be added to 2.2 as item (c) 'establish that the contractor took all reasonable steps to mitigate the effect of the delay'. This is, however, largely a matter of defence and its proper inclusion is arguable.
- (b) Paragraph 2.3 (b): comment *'the provisions of the contract determine the project duration and completion date and that the critical path determines the sequence of operations and what operations are critical and for how long'*. The criticism is accepted. In order to meet this criticism the word **determines** in paragraph 2.3 (b) has been replaced with **corresponds with**.

Other questions were raised in the text:

- (a) One respondent was concerned about the concept of the 'Contract Programme'. There is still a misconception that a programme which is approved or otherwise accepted by the employer or referred to in the contract has some particular status. Compliance with or reliance on a particular programme will not become effective unless there are express words used in the contract. Thus the contract would have to say that the contractor was obliged to follow the programme or that the employer had to approve and accept a particular programme and that the contractor could then rely upon it. For whatever reason parties to construction contracts are reluctant for this to be done in a binding way.

#### **7.2.6 Question 2 - Theoretical Concepts**

All of the respondents considered that the theoretical concepts were adequately explained, although one correspondent was concerned that the matter of concurrency was not fully developed in Chapter 6. This criticism is to some extent understandable as the explanation which appears in Chapter 6 is, as is anticipated in the respondent's query, an abridged version of what appears more fully in Chapter 2.

Other questions were raised in the text:

- (a) Paragraph 3.1 (c): the definition of the approaches to analysis. The particular question raised is a reflection of the confusion caused by the uninformed use of certain expressions by current commentators. The respondent was left unclear as what is meant by 'the contemporaneous approach'. The confusion here is caused by the use of the term Snapshot approach. The footnote follows the definition adopted by Pickavance. See Chapter 2 where this problem is also noted.



- (b) Paragraph 3.3: the practicality of accounting *'for all differences between the planned and actual performance'* is questioned on the grounds of economy and practicality. Paragraph 3.3 should be read in conjunction with footnote 20. It is conceded that it would be impractical to account for 'all differences' in the literal sense.
- (c) Paragraph 3.4: it is said that this is not what Courts and arbitrators do in practice. This is accepted. However, this is not the point. The point is that, as a matter of principle, they should.

#### **7.2.7 Question 3 - Problems of Application**

Of the respondents only one indicated in the questionnaire that additional matters should be included. In the event no additional items were identified.

A number of other comments were raised on items which were already included:

- (a) Paragraph 4.1 (a): comment agreed but respondent suggested that more recent emphasis on contracts which require payments by programme stages is increasing the interest in programmes;
- (b) Paragraph 4.1 (i): need to differentiate between traditional contracting on the one hand and management contracting or construction management on the other. In the case of the latter, the position is not so invidious as against package contractors.
- (c) Paragraph 4.5 (h): not considered practical to identify all delaying events. This point is also discussed above against Paragraph 3.3.

### 7.2.8 Question 4 - The Proposed Approach

All of the respondents considered that the proposal was sound, although one correspondent emphasised the need to ensure that any analysis was not just 'garbage in-garbage out' or based on 'selective use of facts'. It is contended that any analysis which followed the stages set out in the proposal would not fail on these counts.

Other questions were raised in the text:

- (a) Paragraph 5.1 (a): the need to gain an appreciation of the forum within which the analysis will be used and to take account of practical time and cost constraint was emphasised. The proposal anticipates that these factors will be taken into account.
- (b) Paragraph 5.32 (c): a question is raised as to how the as-built data and the As-Built Chart can be compatible with the As-Achievable Chart where there have been changes to the planned sequence of work. The analysis in Chapter 4 did not reveal this as a particular problem in practice although it is considered in the US cases and literature (See also Chapter 2). The poor standard of planning found in practice means that the As-Achievable Chart is almost certainly produced after the event and is therefore likely to reflect the project as constructed. If there have been major changes of sequence introduced post-contract the analysis may have to be split, dealing separately with the delays before and after the major change. The proposal anticipates this by requiring the analyst to obtain an appreciation of the project before planning the analysis work. For example Paragraph 5.3 (b) is concerned to identify the original and revised programmes.
- (c) Paragraph 5.35: the importance of using summary charts is emphasised. Respondent says *'I cannot off hand think of any*

*example of any analysis proving materially persuasive that could not also be summarised onto a single A3 sheet of paper’.*  
The proposal is entirely consistent with this view.

### **7.2.9 Other Amendments**

There were a number of typographical corrections which were noted by the respondents:

- (a) Footnote 5: delete of between expense and additional in the second line.
- (b) Footnote 6: change emphasis to emphasise in first line.
- (c) Paragraph 2.3 (b) change determines to corresponds with in first line.
- (d) Paragraph 2.3 in the summarising sentence: in the third line Item (c) is should be Items (c) and (d) are and in the fourth line Item (d) should be Item (e),.
- (e) Footnote 11: delete the between analysis and may in the second line.
- (f) Footnote 14: insert of between number and delays in the first line of the second paragraph.
- (g) Paragraph 4.5 (d): change analysts to analyst in the first line of the second paragraph.
- (h) Paragraph 5.2 (a): change building to project.
- (i) Paragraph 5.24 (a) (i): At the end of the sentence As-Planned should be As-Achievable.



#### **7.2.10 Summary of the Expert Review Exercise**

The comments and suggestions all related to either minor omissions in the proposal or marginal improvements in content or wording. None of the comments or suggestions revealed any fundamental omission or flaw.

The responses and comments provided show that the respondents found the proposals clearly set out, conceptually sound and of practical application.

The validation exercise confirms that the proposed approach will be acceptable to those who will carry out the analysis and those who must present and prosecute the results.

#### **7.2.11 Observation in Practice**

The proposal has been adopted by Northcrofts Management Services Ltd ('NMS') as the basis of the service it provides in the field of schedule impact analysis. It is now normal for work in connection with the provision of expert services to be obtained in competition. The principles set out in the proposal are now used in any such submission. When a commission is obtained the principles are applied to its performance.

Since adopting these principles NMS have been appointed on 12 projects where delay analysis is required. None of the professional advisers to whom presentations were made questioned the appropriateness of the principles proposed. Of the commissions received all have been progressed using the same approach. Where, in practice, the approach has been questioned those questions have been satisfied by adequate explanation.

## **7.3      Conclusions**

### **7.3.1    The Hypothesis**

It is the hypothesis of this thesis that:

*An effective approach to the analysis of delay claims which satisfies UK legal precedents and practical constraints can be identified by using US practice and legal precedents as a model.*

The hypothesis has been achieved.

An effective approach has been identified and is set out in the proposal in Section 6.5. The proposed approach has been validated in a number of ways.

The method of validation and the results are set out in Section 7.2. The validation confirmed that:

- (a)      the proposed approach fulfils the legal, theoretical and practical requirements;
- (b)      the proposed approach fulfils the hypothesis and in particular that the proposed approach is effective, conceptually sound and of practical application and will improve the efficiency of the preparation and prosecution of delay claims.

The proposed approach is derived from the analysis of legal and theoretical concepts and practical problems set out in Chapters 2, 3, 4 and 5.

## **Chapter 2**

The development of Schedule Impact Analysis using Computer Scheduling Techniques in the USA is analysed. The analysis provided

information about a number of approaches and methods of analysis and has provided a framework within which the methodology is required to function. Each of the methods in use are described and reviewed in detail.

The general principles derived from the examination of the development and use of Schedule Impact Analysis using Computer Scheduling Techniques in the USA are then developed. This further development revealed that there are three distinct approaches to time analysis (i) prospective, (ii) contemporaneous, and (iii) retrospective. For each approach there are a number of methods available which range from simple to extremely complex.

The published material relating to the use and development of Schedule Impact Analysis using Computer Scheduling Techniques in the UK is examined. The review of these works provided the opportunity to distil the principles which should inform the choice of approach appropriate for use in the UK. This revealed that the volume and depth of material available in the USA is far greater than that available in the UK. This research shows that there are differences, particularly in the approach to construction project planning, which mean that it may not be possible to simply copy the methods of analysis which have found favour in the USA. These differences are likely to act as a constraint to the development of the approach for use in the UK. These differences and constraints are then accommodated in developing the theoretical concepts in Chapter 3. Recent UK reference works are reviewed and conclusions drawn from them in respect of the appropriate approach to analysis.

The analysis of decided cases relevant to the presentation of delay claims identified the principles of law and practical application.

The analysis of decided cases relevant to the particularisation of claims in general identified the principles of law and practical application. In the event the cases dealing with particularisation provide little or no direct



assistance in regard to the form that any analysis ought to take. The necessity to provide an analysis which will satisfy the need to plead a clear and concise case, contain sufficient material to avoid complaints about a lack of particularisation and yet avoid unnecessary detail and complexity is identified.

### **Chapter 3**

The general legal principles as related to the time for completion of construction contracts and the way in which they are incorporated in construction contracts are examined. It is concluded that the provisions in the standard forms are reasonably clear and comprehensive. Provisions in sub-contracts are likely to be less certain.

Chapter 3 also:

- (a) Examined the way in which it may be anticipated that claims might arise.
- (b) Developed the principles of analysis.
- (c) Considered the preparation of the various schedules required to demonstrate delay.
- (d) Considered the basic requirements of the analysis and the presentation of the results.
- (e) Developed and set out the theoretical concepts.

### **Chapter 4**

The case studies and other sources of information that provide the basis for the analysis in Chapter 4 are described.

The general legal principles as related to the time for completion of construction contracts are considered. By and large such provisions are clear but problems are likely to occur in one off type contracts. Special provisions which seek to impose a higher than normal burden on one or other of the parties also often fail to provide the desired result.

The way in which claims arise in practice is examined. It was found that disputes most often arise in respect of the adequacy and/or efficiency of resources and in particular labour and the availability and/or adequacy of construction information. The adequacy and/or effectiveness of planning and management are significant factors in the cause and control of delay.

The methods of analysis actually encountered in practice are analysed. This confirmed the expectation that the standard of analysis currently in use is particularly low.

The practical problems encountered in producing the various schedules required to demonstrate delay are considered. This again reflected the difference in approach to both construction planning and the analysis of delay identified between the US and UK. The adequacy of record keeping is likely to be a key factor in determining the nature of the analysis that can be accomplished.

The form of analysis and presentation encountered in practice were considered. This confirmed the expectation that the standard of presentation currently in use is particularly low.

## **Chapter 5**

The theoretical concepts set out in Chapter 3 and current practice, as described in Chapter 4 are compared. General problems and particular areas in which current practice falls short of the legal principles and theoretical concepts and other key factors are identified.

**The problems fall into one or more of the following three categories:**

- (a) Those which may be (the) cause(s) of delay and contribute to the need to produce an analysis;**
- (b) Those that the analyst must recognise may affect his choice of analysis method; and**
- (c) Those which the method of analysis must be capable of accommodating.**

**None of the problems encountered in practice would lead to the need to amend the principles of analysis but difficulties of application that need to be resolved in any analysis are identified.**

## **Chapter 6**

**A proposal for an approach to delay analysis and the proof of time entitlement that satisfies UK legal precedents and practical constraints, using US practice and legal precedents as a model, is developed. The three key requirements for an analysis are:**

- (a) compliance with legal principles;**
- (b) compliance with theoretical concepts;**
- (c) the ability to meet the practical problems of application found in practice.**

**A re-statement of the key requirements is provided. The key requirements are identified and developed in Chapters 2, 3, 4, and 5 and for that reason it was considered appropriate to collect and distil those matters together. No such collection and distillation is currently available.**



The proposal is set out by way of the description of a process of analysis that complies with all of the key requirements. The breadth of this Chapter is dictated by the need to develop the proposal from first principles, as there is no previous proposal available which covers the complete scope of such a process.

The legal principles and the theoretical concepts and their application to the formulation of an approach to delay analysis are restated.

The practical problems and their potential impact on the formulation of the approach to delay analysis are examined.

The proposed process for completing a time analysis of a construction project is set out in Section 6.5.

### **7.3.2 The Research Objectives**

The research objectives set for each Chapter have been attained:

- (a) Chapter 2 included a review of current literature and decided cases. That chapter identified a number of alternative methods of delay analysis from the published literature which could be of use in the UK. A number of the methods identified were considered to be unsuitable and were not developed further. A number of general principles were also distilled from the decided cases reviewed in Chapter 2. The conclusions of Chapter 2 met the expectation that such a review would identify a range of suitable methods and guiding principles to be adopted in defining a suitable approach for use in the UK.
- (b) Chapter 3 developed the potentially suitable methods and guiding principles and set out the theoretical concepts which apply to the analysis of delay. The result of that development was the definition of a suitable process for the analysis of delay.

- (c) Chapter 4 took the theoretical concepts and the defined process and considered the way in which those matters do, or might, fare in practice. In particular the review of current practice identified failings in the approach to construction planning, the adequacy of record keeping and the understanding and awareness of those prosecuting delay claims as to the methods and techniques available for use.
- (d) Chapter 5 compared and contrasted the theoretical concepts set out in Chapter 3 with the findings of the analysis of current practice and identified the problem areas.
- (e) Having identified the theoretical concepts in Chapter 3, tested those concepts to see how they fare in practice in Chapter 4 and identified problems of practical application in Chapter 5, Chapter 6 analysed the problem areas and identified solutions to those problems. Chapter 6 then incorporates the solutions with the theoretical concepts to develop the proposal for the analysis of delay claims.

Many presentations currently produced in the UK are trying to use sophisticated computer software and graphical presentations with US methodology taken on a pick and mix basis without an adequate understanding for the underlying principles.

The contemporaneous approach has, to a large extent, found favour over the prospective in the US. In the US the retrospective approach has proved as successful as the contemporaneous.

It is necessary for development in the UK to start with a simple form and develop towards the a more sophisticated approach. In this way the form of analysis can be developed in a manner best suited to the particular features of the UK construction industry.

An analysis which works and is free from factual errors would be difficult to defeat whatever methodology was employed. A Judge or Arbitrator is unlikely to dismiss a working analysis unless he is presented with a choice and is given good reason to prefer one over another.

The choice of approach should be made after considering the circumstances of the particular project to be analysed.

If analysts carrying out Schedule Impact Analysis adopt the proposals set out in Chapter 6 the results will be acceptable to those charged with presenting and deciding delay claims.

#### **7.4 Limitations of the Research**

The technical information base used for this research has been mainly collected from construction contracts relating to building and civil engineering work. Projects within the areas petrochemical and power engineering sector were also represented.

Although it is believed that the principles distilled in the proposal ought to hold good for all forms of construction this may not be the case.

#### **7.5 Recommendations for Further Research**

This research has identified, but has been unable to explain, the following factors:

- (a) that a high number of construction projects are completed late;
- (b) that many contractors put insufficient effort into detailed planning;
- (c) a reluctance on the part of employers and members of the design to take an active part in construction project planning;



- (d) a potential link between the standard of construction planning and the ability to obtain extension of time and/or succeed in successfully prosecuting a delay claim;
- (e) given the limitations of this research as set out above further research into the question of the applicability of the process of analysis to project management situations generally.

It is suggested that each of these factors is worthy of further research.

It is also suggested that the relationship between these factors should be explored.

## **Appendix 1**

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### **Appendix 3**

#### **Appointments of Northcrofts Management Services Ltd on Delay Claims**

**Appointments of Northcrofts Management Services Ltd on Delay Claims**

<b>Job Number</b>	<b>Job</b>	<b>Nature of Appointment</b>	<b>Forum</b>	<b>Work Performed</b>	<b>Date of Appointment</b>	<b>Amount in Dispute</b>
88/4232	Refurbishment of headquarters building in City of London.	Expert Witness	Arbitration and Litigation	Advice on contractors loss and expense claims. Preparation of points of claim and provision of F&BP in action against consultants re late design etc.	June 1988	£5m
88/7011	International Contractor v. UK Steelwork Supplier	Claims analysis	Litigation	Analysis of loss and expense claims made by contractor for section of Singapore MRT system against supplier arising from failure of sheet piling; advice on settlement	April 1989	SS25m
89/7012	International Exhibition Building	Audit, Claims analysis and Expert Witness	Arbitration - domestic	Preliminary advice on claims avoidance; Audit; claims analysis; assistance with pleadings. NMS acted as expert on liability, management, time and quantum issues on behalf of the employer against the Project Manager.	June 1989	£11m
89/7023	Brickwork Subcontract on Central London Residential Redevelopment	Preliminary advice		Preliminary advice on final account and delay claims.	October 1989	£1m
89/7026	Demolition Contractor v. Main Contractor	Expert Witness	Litigation	Expert report on quantum and time issues of claim by demolition sub-contract following termination.	November 1989	£300k
89/7027	Brickwork Subcontract on Basildon Centre	Claims analysis, Final Account advice, Arbitration		Analysis of delay and disruption claims, Final Account advice.	September 1989	£220k
89/7028	Cinema Chain	Claims analysis	Litigation	Detailed Affidavit for Order 14 application dealing with the value of delay and disruption claims on 15 projects.	October 1989	£25m
89/7032	Aluminium Foil Plant Bridgnorth	Preliminary report		Report on likely final amount payable to the contractor and responsibility for delay/likely recovery of liquidated damages.	November 1989	£429k
89/7035	CEGB Control Centre	Preliminary report		Review of project management and progress reporting.	December 1989	N/A
89/7036	City Centre Redevelopment Bristol	Claims analysis	ADR	Time analysis and preparation and presentation of claims at ADR.	January 1990	£100m
90/7045	Contractor v. Equipment Supplier/Installer	Expert Witness	Litigation	Analysis of delay claims.	May 1990	£350k

**Appointments of Northcrofts Management Services Ltd on Delay Claims**

<b>Job Number</b>	<b>Job</b>	<b>Nature of Appointment</b>	<b>Forum</b>	<b>Work Performed</b>	<b>Date of Appointment</b>	<b>Amount in Dispute</b>
90/7052	Roadworks Contractor v. Local Authority.	Expert Witness	Arbitration	Expert report in respect of a claim by contractor for losses incurred as a result of delay caused by a refusal to comply with an instruction to remove defective road surfacing material	August 1990	£1m
90/7054	Fabricator v. Off Shore Contractor	Arbitrator	Arbitration - domestic	Award dealing with responsibility for delay.	October 1990	£2m
90/7058	Roadworks Contractor v. Local Authority.	Expert Witness	Arbitration	Expert reports on claim by contractor in respect of the value of variations and for delay in connection with a lane rental scheme.	January 1991	£750k
90/7059	Partition Contractor v. Main Contractor	Expert Witness	Arbitration - domestic	Preparation of experts report and providing advice on defence and counterclaim against sub contractor.	December 1990	£50k
90/7063	Formwork Contractor v Main Contractor	Expert Witness	Arbitration - domestic	Report on delay and disruption claims.	April 1991	£1.5m
91/7068	Office Development Bristol	Claims analysis		Advice on terms of Management Contract regarding programming and delays. Advice in respect of Package Contractors claims for delay and disruption.	October 1991	£2m
91/7071	Pipework Contractor v. Industrial Client	Expert Witness	Litigation	Expert report on contractors loss and expense claim and claim for delay. Report also covered the employers allegations of delay in performance and an analysis of performance to defend termination claim.	November 1991	£1.5m
91/7074	IC House	Expert Witness	Litigation	Expert for architect joint defendant in Employer's claim against management contractor and designers.	November 1991	£32m
91/7075	Roadworks Contractor v. Local Authority.	Expert Witness	Arbitration - domestic	Report on variation and delay claims.	December 1991	£1.3m
91/7080	Hospital Middle East	Expert Witness	Arbitration - international (ICC)	Expert on time, management and quantum issues on behalf of the employer. The contract was terminated. The contractor went to arbitration through the ICC and claimed that the termination was invalid.	April 1992	£12m



## Appointments of Northcrofts Management Services Ltd on Delay Claims

Job Number	Job	Nature of Appointment	Forum	Work Performed	Date of Appointment	Amount in Dispute
91/7081	Centre Redelopment, Leicester	Claims analysis	Litigation	Preliminary advice; direct instructions to Counsel; claims analysis, including delay analysis; drafting pleadings; drafting further and better particulars.	May 1992	£2.5m
91/7082	Centre Redevelopment, Barnsley	Preliminary advice only	Litigation	Preliminary advice on claims analysis	April 1992	£1.75m
92/7085	Services Contractor v. Main Contractor	Claims analysis	Litigation	Review of sub-contractor Final Account and loss and expense claims.	July 1992	£500k
92/7094	Fabricator v. Off Shore Installation Contractor	Arbitrator	Arbitration - domestic	Appointment dealing with claims arising out of diving and construction contract for underwater manifold and oil gathering installation.	January 1992	£2m
92/7096	Employer v. Project Manager	Expert Witness	Litigation	Time, Liability and Quantum Expert for plaintiff in professional negligence claim against Project Controller and Quantity Surveyor arising out of settled contractor's claims and other cost overruns.	November 1992	£18m
92/7098	Roadworks Contractor: M25	Expert Witness	Arbitration - domestic	Preparation of Expert Report.	February 1993	£3m
92/7100	Shopping Centre Bayswater	Expert Witness		Advice in respect of Further and Better Particulars. Preparation of replies to F&BP. Preparation of As Built Programme and delay analysis. NMS acted as expert in respect of time and quantum issues in respect of a claim against the engineer.	February 1993	£20m
92/7102	Contractor: Portsmouth Hospital	Claims analysis		NMS acted as expert in respect of planning and quantum on behalf of a contractor defending a claim for defects in respect of floor screeds. The report was in respect the cost of replacing the screeds whilst causing the minimum disruption to the hospital.	March 1993	£5m
93/7108	Partition Contractor v Main Contractor	Expert Witness	Arbitration - domestic	Preparation of time and loss and expense claims for dry lining contractor in preparation for Arbitration; advice on settlement.	May 1993	£1.5m

## Appointments of Northcrofts Management Services Ltd on Delay Claims

Job Number	Job	Nature of Appointment	Forum	Work Performed	Date of Appointment	Amount in Dispute
93/7115	Shopping Centre, Ilford	Expert Witness		Analysis of management contractor's claim against piling sub-contractor in respect of acceleration allegedly arising from delays caused by defective piling; advice on settlement.	November 1993	£750k
93/7116	Contractor v. Employer	Arbitrator	Arbitration - domestic.	Arbitration award dealing with value of account and claims for delay.	April 1994	£150k
93/7118	Design and Build Contractor v. Architect	Expert Witness	Litigation	Quantum Expert for defendant multi-disciplinary designer in High Court action by design and construct contractor.	April 1994	£25m
94/7125	Employer v Construction Manager	Expert Witness	Formal ADR and Litigation	Time Expert for plaintiff developer against construction manager	August 1994	£100m
94/7127	Funder v Solicitor	Expert Witness	Litigation	Quantum Expert for defendant solicitor in connection with funder's claim in respect of insolvent development venture; detailed investigation of project status and time and cost to complete.	November 1994	£85m
94/7128	Design and Build Contractor v. Engineer	Expert Witness	Litigation	Quantum Expert for defendant services design engineer in claims for delay and loss and expense by design and build contractor and sub-contractor; advice on settlement	November 1994	£27m
94/7137	UN Conference Centre, Ethiopia	Claims analysis	Arbitration - international (ICC)	Claims analysis; drafting claims for extension of time and loss and expense; management of final accounting as underpinning to claims for loss and expense; negotiating and assisting in day-to-day conduct of the contract	May 1995	
95/7142	Contractor v Employer.	Claims analysis	Arbitration - domestic	Report on delay claim submitted to Employer.	June 1995	£350k
95/7149	Employer v Project Manager	Expert Witness	Litigation	Appointment as Expert in respect of Project Management matters in relation to building defects dispute, assistance with requests for Further and Better Particulars.	July 1995	£20m
95/7150	Off-Shore Erection Contractor v Owner	Tribunal appointed expert	Arbitration - international (ICC)	Tribunal-appointed expert under ICC rules to produce report on delays to hook-up contract on oil platforms.	July 1995	US\$43m

**Appointments of Northcrofts Management Services Ltd on Delay Claims**

<b>Job Number</b>	<b>Job</b>	<b>Nature of Appointment</b>	<b>Forum</b>	<b>Work Performed</b>	<b>Date of Appointment</b>	<b>Amount in Dispute</b>
95/7153	Oil Refinery	Claims analysis	(Not applicable)	Advice to joint venture owner on cost of construction and time for performance, assistance in analysis of performance and claims avoidance.	July 1995	
95/7155	Contractor v Owner	Arbitrator	Arbitration - domestic.	Arbitration award dealing with value of account and claims for delay.	September 1995	£75k
95/7162	Contractor v Owner	Arbitrator		Arbitration in respect of the value of the account and claims for delay.	February 1996	£250k
95/7165	Owner v Designers	Expert Witness	Litigation	Advice on settlement of contractor claims and recovery against professionals; assist in drafting pleadings, drafting of Scott Schedule, assist with F&BP's. Expert report on potential recovery of losses due to contractors claims for delay.	February 1996	£15m
96/7172	Contractor v Owner	Arbitrator		Arbitration in respect of the value of the account and claims for delay.	June 1996	£200k
96/7177	EPC Contractor v Owner	Expert Witness	Litigation	Expert report on time and quantum issues.	August 1996	£20m
96/7183	Employer v Designers	Claims advice		Preliminary report on performance of professional team, including review of delays/responsibility.	December 1996	
96/7184	Industrial Building	Claims advice		Preliminary report on performance of professional team, including review of delays/responsibility.	December 1996	
96/7187	Office Redevelopment	Expert Witness	Arbitration	Preliminary advice on Architects extension of time award, QS valuation of Final Account. Preliminary analysis of Contractors claim in Arbitration proceedings and advice in respect of the preparation of the Defence and Counterclaim.	November 1996	£4m
96/7189	Steel Ducting and Pipework Erector v Contractor	Expert Witness	Arbitration	Report on variation account and delay/acceleration claims.	January 1997	£750k



**Appointments of Northcrofts Management Services Ltd on Delay Claims**

<b>Job Number</b>	<b>Job</b>	<b>Nature of Appointment</b>	<b>Forum</b>	<b>Work Performed</b>	<b>Date of Appointment</b>	<b>Amount in Dispute</b>
97/7204	Steel Lining Erector v Contractor	Expert Witness	Litigation	Expert report on evaluation of variations to welding procedures, in particular impact on method of construction/period of performance.	May 1997	£1.3m
97/7208	Owner v Project Manager	Expert		Preliminary report on performance of project manager, including review of delays/responsibility.	July 1997	
97/7212	Contractor v Housing Association	Arbitrator	Arbitration	Producing a number of Awards dealing with value of Final Account and delay claims.	July 1997	£300k
97/7213	Pipework Erector v Owner	Expert	Litigation	Expert report on contractors claims and on the performance of project manager.	July 1997	£5m
97/7221	Hotel Manchester	Claims advice		Preliminary report on performance of professional team, including review of delays/responsibility.	October 1997	
97/7226	Contractor v Owner	Arbitrator	Arbitration	Producing Awards dealing with value of Final Account and delay claims.	November 1997	£450k
97/7230	Steel Ducting and Equipment Erector v Contractor	Expert	Arbitration	Expert report on contractors loss and expense and delay claim.	January 1998	£1.1m
97/7237	Refinery Refit Trinidad	Expert	Arbitration	Expert report on contractors loss and expense and delay claim.	May 1998	\$30m
98/7253	Private Residence	Claims advice		Review of Architects extension of time.	August 1998	
98/7258	Owner v Architect	Claims advice		Preliminary report on performance of project manager, including review of delays/responsibility.	August 1998	
98/7259	Acquisition of International Contractor	Claims advice		Valuation report on the delay and disruption claims on 40 projects for potential purchasers.	September 1998	£40m
98/7266	Hotel Manchester	Expert	Arbitration	Expert report on contractors delay claim.	November 1998	£3m

## **Appendix 4**

### **Analysis of The Problems Identified in Chapter 5**

## Analysis of The Problems Identified in Chapter 5

**Table 2 Analysis of Impacts and Their Accomodation**

<b><u>Item</u></b>	<b><u>Impact on Process or Method of Analysis</u></b>	<b><u>Details of How the Impact Is to be Accomodated</u></b>
(a) (i)	<p>Need to understand what information is available before confirming approach.</p> <p>Nature of approach may be limited to prospective analysis if there is no contemporaneous performance data available.</p>	<p>Proposed process requires the analyst to identify what information is available before confirming the method of analysis.</p>
(a) (ii)	<p>Need to understand what information is available before confirming approach.</p> <p>Need to consider timing of analysis in relation to availability of remote party documents.</p>	<p>Proposed process requires the analyst to identify what information is available before confirming the method of analysis.</p>
(b) (i)	<p>The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.</p> <p>The nature of the problem will dictate level of detail used in the analysis and/or use of time windows.</p>	<p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.</p> <p>Proposed method will facilitate the use of layered analysis or analysis within time windows.</p>
(b) (ii)	<p>The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.</p> <p>Separate critical paths will need separate analysis.</p>	<p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.</p> <p>Proposed method will allow the use of parallel analyses.</p>
(b) (iii)	<p>The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.</p> <p>Separate analysis may be required for each party.</p>	<p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.</p> <p>Separate As-Impacted Charts can be produced to reflect the liability each party.</p>
(c)	<p>Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.</p>	<p>Proposed method is not limited to use with any particular project management software package.</p>
(d)	<p>Choice of approach may be limited to a prospective analysis if time and/or financial constraints are paramount.</p>	<p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.</p>
(e)	<p>The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.</p>	<p>Proposed method requires verification of the original plan.</p>
(f)	<p>Where a large amount of complex data is involved the analysis may have to be layered (use of a number of levels of analysis) or the project will have to be analysed in a number of discrete time periods (window analysis).</p>	<p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before selecting method of analysis.</p> <p>Proposed method will facilitate the use of layered analysis or analysis within time windows.</p>
(g)	<p>The method of analysis must identify all delaying factors.</p>	<p>Proposed method requires the identification and inclusion of all delaying events.</p>



**Analysis of The Problems Identified in Chapter 5****Table 2 Analysis of Impacts and Their Accomodation**

<b><u>Item</u></b>	<b><u>Impact on Process or Method of Analysis</u></b>	<b><u>Details of How the Impact is to be Accomodated</u></b>
<b>(b)</b>	The contractual analysis must rationalise the delaying factors and identify those which affect the completion date and the party responsible.	Proposed method requires the identification and inclusion of all delaying events and provides the facility to separate delays caused by different parties.
<b>(c)</b>	Selected approach must provide a clear connection between the alleged breach of contract and the impact on completion.	Proposed process will provide proper identification of the causal link.
<b>(d)</b>	Selected approach must provide a clear and uncomplicated presentation.	Proposed process will lead to the production of a clear and uncomplicated presentation.

**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

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**Construction contracts do not place a high enough priority on the production and consideration of construction programmes.**

---

**Nature of Problem**

May cause delay.

There is a need to improve the attitude of contractors, Employers and consultants towards construction planning.

Must be accommodated by the method of analysis.

The starting point of any analysis must be to establish what would have happened had there been no delaying events. It is therefore necessary to establish the time that the project would have taken as originally conceived. The analysis of legal principles shows this to be a basic evidential requirement.

It is necessary to establish whether the original programme is adequate for use as the As-Achievable Chart.

**Impact on Process or Method of Analysis**

The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.

**Details of How the Impact is to be Accomodated**

Proposed method requires verification of the original plan.

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**Many contractors put insufficient effort into detailed planning.**

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**Nature of Problem**

May cause delay.

There is a need to improve the attitude of contractors, Employers and consultants towards construction planning.

Must be accommodated by the method of analysis.

The starting point of any analysis must be to establish what would have happened had there been no delaying events. It is therefore necessary to establish the time that the project would have taken as originally conceived. The analysis of legal principles shows this to be a basic evidential requirement.

It is necessary to establish whether the original programme is adequate for use as the As-Achievable Chart.

**Impact on Process or Method of Analysis**

The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.

**Details of How the Impact is to be Accomodated**

Proposed method requires verification of the original plan.

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**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

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**A high proportion of delay claims relate to common complaints about, for example, the flow of construction information which could be avoided.**

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**Nature of Problem**

May cause delay.

Need for designers to improve performance.

Must be accommodated by the method of analysis.

Complex information flow claims are difficult to analyse.

Will the time analysis require the resolution of complex information flow complaints.

It is important that the presentation should be as clear and uncluttered as possible. A complicated and confused presentation will not convince anyone of the causes of delay to the project.

It is necessary to establish whether the time analysis will require the identification of complaints against a number of different design disciplines?

Although the analyst should have this in mind from the outset the actual level of analysis required may not be capable of being established until some analysis has been completed.

**Impact on Process or Method of Analysis**

Where a large amount of complex data is involved the analysis may have to be layered (use of a number of levels of analysis) or the project will have to be analysed in a number of discrete time periods (window analysis).

**Details of How the Impact is to be Accommodated**

Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before selecting method of analysis.

Proposed method will facilitate the use of layered analysis or analysis within time windows.



**Analysis of The Problems Identified in Chapter 5**

**Table 1 - Analysis of Problems and Their Impacts**

<b>A limited number of delay claims relate to novel factual causes which probably could not be foreseen. .</b>	
<b><u>Nature of Problem</u></b>	
May cause delay.	
Must be accomodated by the method of analysis.	
Novel problems may require a novel approach.	
Need to understand the particular problems on the project to be analysed.	
An experienced analyst will be conscious of the effect that the particular nature of the project and the problems which have occurred will have on the approach to the analysis and the form of the presentation that will be required.	
Need to select an approach which is capable of demonstrating the impact of each delaying event on the overall project completion date. Thus there is a need to show the critical path.	
<b><u>Impact on Process or Method of Analysis</u></b>	
The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.	
The nature of the problem will dictate level of detail used in the analysis and/or use of time windows.	
<b><u>Details of How the Impact is to be Accomodated</u></b>	
Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.	
Proposed method will facilitate the use of layered analysis or analysis within time windows.	

Analysis of The Problems Identified in Chapter 5

Table 1 - Analysis of Problems and Their Impacts

<p>Where intermediate completion dates are required these are often not adequately covered in the contractual provisions. .</p>
<p><u>Nature of Problem</u></p> <p>May cause delay.</p> <p>Adequate contractual provisions required to ensure that handover dates are clear.</p> <p>Must be accomodated by the method of analysis.</p> <p>The analyst needs to understand whether is it necessary to establish multiple critical paths through the project.</p> <p>A experienced analyst will be conscious of the effect that the particular nature of the project and the problems which have occurred will have on the approach to the analysis and the form of the presentation that will be required.</p> <p>Need to select an approach which is capable of demonstrating the impact of each delaying event on the overall project completion date. Thus there is a need to show the critical path.</p> <p><u>Impact on Process or Method of Analysis</u></p> <p>The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.</p> <p>Separate critical paths will need separate analysis.</p> <p><u>Details of How the Impact is to be Accomodated</u></p> <p>Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.</p> <p>Proposed method will allow the use of parallel analyses.</p>
<p>Failure to deal with delays when they occur means that proper records are often not available when the analysis is actually carried out and that the Employer is poorly advised about the likely completion date of the project.</p>
<p><u>Nature of Problem</u></p> <p>May cause delay.</p> <p>May affect choice of analysis method.</p> <p>Nature of approach may be limited to prospective analysis if there is no contemporaneous data available.</p> <p>Must be accomodated by the method of analysis.</p> <p>Can the approach reach a proper conclusion in the absence of contemporaneous analysis.</p> <p>An experienced analyst will know what documents ought to be available and should also be conscious of the effect that omissions from that basic data will have on the nature of the analysis which can be produced. The experienced analyst will know that remote party documents may only be available on discovery and will also be conscious of the fact that the disclosure of that material may shed and entirely different light on the cause(s) of delay.</p> <p><u>Impact on Process or Method of Analysis</u></p> <p>Need to understand what information is available before confirming approach.</p> <p>Nature of approach may be limited to prospective analysis if there is no contemporaneous performance data available.</p> <p><u>Details of How the Impact is to be Accomodated</u></p> <p>Proposed process requires the analyst to identify what information is available before confirming the method of analysis.</p>

**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

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**8 Project records are often insufficient to support a full delay analysis.**

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**Nature of Problem**

May cause delay.

Adequate contractual provisions required to ensure proper records are kept.

May affect choice of analysis method.

Nature of approach may be limited to prospective analysis if there is no contemporaneous data available.

An experienced analyst will know what documents ought to be available and should also be conscious of the effect that omissions from that basic data will have on the nature of the analysis which can be produced. The experienced analyst will know that remote party documents may only be available on discovery and will also be conscious of the fact that the disclosure of that material may shed an entirely different light on the cause(s) of delay.

Must be accommodated by the method of analysis.

Can the approach reach a proper conclusion in the absence of contemporaneous performance data.

**Impact on Process or Method of Analysis**

Need to understand what information is available before confirming approach.

Nature of approach may be limited to prospective analysis if there is no contemporaneous performance data available.

**Details of How the Impact is to be Accomodated**

Proposed process requires the analyst to identify what information is available before confirming the method of analysis.



## Analysis of The Problems Identified in Chapter 5

**Table 1 - Analysis of Problems and Their Impacts**

**In respect of the provision of information, an Employer's obligation to the contractor will be significantly higher than the designer's obligation to the Employer.**

### Nature of Problem

May cause delay.

Need to consider effectiveness of designers terms of engagement.

Adopted approach must be capable of allocating responsibility to various parties.

Must be accommodated by the method of analysis.

Adopted approach must be capable of allocating responsibility to various parties.

An experienced analyst will be conscious of the effect that the particular nature of the project and the problems which have occurred will have on the approach to the analysis and the form of the presentation that will be required.

Need to select an approach which is capable of demonstrating the impact of each delaying event on the overall project completion date. Thus there is a need to show the critical path.

### Impact on Process or Method of Analysis

The method of analysis must be suitable for the nature of the particular project and its delaying factors before confirming approach.

Separate analysis may be required for each party.

### Details of How the Impact is to be Accomodated

Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.

Separate As-Impacted Charts can be produced to reflect the liability each party.

**An Employer may find itself in an invidious position faced with the need to defend a poorly particularised delay claim with inadequate records available to it. .**

### Nature of Problem

May affect choice of analysis method.

Nature of approach may be limited to prospective analysis if there is no contemporaneous data available.

An experienced analyst will know what documents ought to be available and should also be conscious of the effect that omissions from that basic data will have on the nature of the analysis which can be produced. The experienced analyst will know that remote party documents may only be available on discovery and will also be conscious of the fact that the disclosure of that material may shed an entirely different light on the cause(s) of delay.

Must be accommodated by the method of analysis.

Can the approach reach a proper conclusion in the absence of contemporaneous performance data.

### Impact on Process or Method of Analysis

Need to understand what information is available before confirming approach.

Nature of approach may be limited to prospective analysis if there is no contemporaneous performance data available.

### Details of How the Impact is to be Accomodated

Proposed process requires the analyst to identify what information is available before confirming the method of analysis.

**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

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**A party may not have direct access to all the documents in the possession of its opponent.**

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**Nature of Problem**

May affect choice of analysis method.

Nature of approach may be limited to prospective analysis if there is no contemporaneous data available.

An experienced analyst will know what documents ought to be available and should also be conscious of the effect that omissions from that basic data will have on the nature of the analysis which can be produced. The experienced analyst will know that remote party documents may only be available on discovery and will also be conscious of the fact that the disclosure of that material may shed an entirely different light on the cause(s) of delay.

Must be accommodated by the method of analysis.

Can the approach reach a proper conclusion in the absence of contemporaneous performance data.

**Impact on Process or Method of Analysis**

Need to understand what information is available before confirming approach.

Need to consider timing of analysis in relation to availability of remote party documents.

**Details of How the Impact is to be Accomodated**

Proposed process requires the analyst to identify what information is available before confirming the method of analysis.

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**There is no consensus amongst those technical and legal professionals involved in the production and prosecution of delay claims as to how such claims should be approached or the direction in which the approach ought to be developed.**

---

**Nature of Problem**

May affect choice of analysis method.

Will the approach be convincing to those who must present the case.

Any analysis is more likely to be accepted if the presentation, in particular, is in a form which is recognisable to those who need to understand it.

Must be accommodated by the method of analysis.

Simple bar charts are the best form of presentation, although they should be supported by an underlying network analysis. If planning software has been used during the project then the same software should, wherever possible, be used for the time analysis. A time analysis is most likely to be acceptable if can be portrayed as an extension of the project planning and progress recording system.

Once proven successful any approach is likely to be adopted as standard.

**Impact on Process or Method of Analysis**

Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.

**Details of How the Impact is to be Accomodated**

Proposed method is not limited to use with any particular project management software package.

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**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

**Many technical experts and/or lawyers appointed to advise in the production and prosecution of delay claims are not conversant with the choices of approach available. There is no reference base, either for theoretical options or the practical solutions which have been attempted.**

**Nature of Problem**

May affect choice of analysis method.

Will the approach be convincing to those who must present the case.

Any analysis is more likely to be accepted if the presentation, in particular, is in a form which is recognisable to those who need to understand it.

Must be accommodated by the method of analysis.

Simple bar charts are the best form of presentation, although they should be supported by an underlying network analysis. If planning software has been used during the project then the same software should, wherever possible, be used for the time analysis. A time analysis is most likely to be acceptable if can be portrayed as an extension of the project planning and progress recording system.

Once proven successful any approach is likely to be adopted as standard.

**Impact on Process or Method of Analysis**

Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.

**Details of How the Impact is to be Accomodated**

Proposed method is not limited to use with any particular project management software package.

**There is incompatibility between the theoretical concepts which can be deduced from available material and the understanding of those concepts by those producing and prosecuting delay claims. Consequently those theoretical concepts are not being deployed and developed in a structured way.**

**Nature of Problem**

May affect choice of analysis method.

Will the approach be convincing to those who must present the case.

Must be accommodated by the method of analysis.

Simple bar charts are the best form of presentation, although they should be supported by an underlying network analysis. If planning software has been used during the project then the same software should, wherever possible, be used for the time analysis. A time analysis is most likely to be acceptable if can be portrayed as an extension of the project planning and progress recording system.

Once proven successful any approach is likely to be adopted as standard.

**Impact on Process or Method of Analysis**

Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.

**Details of How the Impact is to be Accomodated**

Proposed method is not limited to use with any particular project management software package.



Analysis of The Problems Identified in Chapter 5

Table 1 - Analysis of Problems and Their Impacts

Parties seeking to pursue delay claims are often reluctant to invest time and money in an extensive delay analysis. This tends to result in the assembly of ad hoc presentations with no particular methodology or the use of descriptive rather than analytical presentations. The fuller analysis is then deferred until the issues are clarified or the analysis is required for the basis of an expert report.

Nature of Problem

- May affect choice of analysis method.
- Time and/or financial constraints will impact the nature and the extent of analysis Is the approach able to accommodate time and/or financial constraints and still produce a meaningful presentation.
- Must be accomodated by the method of analysis.

Impact on Process or Method of Analysis

Choice of approach may be limited to a prospective analysis if time and/or financial constraints are paramount.

Details of How the Impact is to be Accomodated

Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.

As-Achievable Charts are often poor because the underlying original construction plan is poor. The result may be an analysis which is easily open to attack.

Nature of Problem

- Must be accomodated by the method of analysis.
- The starting point of any analysis must be to establish what would have happened had there been no delaying events. It is therefore necessary to establish the time that the project would have taken as originally conceived. The analysis of legal principles shows this to be a basic evidential requirement.
- It is necessary to establish whether the original programme is adcquate for use as the As-Achievable Chart.

Impact on Process or Method of Analysis

The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.

Details of How the Impact is to be Accomodated

Proposed method requires verification of the original plan.

## Analysis of The Problems Identified in Chapter 5

**Table 1 - Analysis of Problems and Their Impacts**

**P As-Built Charts are often poor because there are insufficient records to produce a complete as-built picture. The result may be an analysis which is easily open to attack.**

### Nature of Problem

May affect choice of analysis method.

Can the approach reach a proper conclusion in the absence of contemporaneous performance data.

An experienced analyst will know what documents ought to be available and should also be conscious of the effect that omissions from that basic data will have on the nature of the analysis which can be produced. The experienced analyst will know that remote party documents may only be available on discovery and will also be conscious of the fact that the disclosure of that material may shed an entirely different light on the cause(s) of delay.

Must be accommodated by the method of analysis.

### Impact on Process or Method of Analysis

Need to understand what information is available before confirming approach.

Nature of approach may be limited to prospective analysis if there is no contemporaneous performance data available.

### Details of How the Impact is to be Accomodated

Proposed process requires the analyst to identify what information is available before confirming the method of analysis.

**P There is a serious difficulty in demonstrating the link between cause and effect in the context of delay claims. Presentations fail in clearly demonstrating the cause of any delaying events.**

### Nature of Problem

May affect choice of analysis method.

Is the approach capable of establishing the link between cause and effect.

Must be accommodated by the method of analysis.

This requires that the factual data is accurately portrayed in the analysis, that the analysis includes an explanation of how the breach caused the difference which has been identified between the planned and actual performance and that the analysis uses a proper critical path network to demonstrate the impact(s).

### Impact on Process or Method of Analysis

Selected approach must provide a clear connection between the alleged breach of contract and the impact on completion.

### Details of How the Impact is to be Accomodated

Proposed process will provide proper identification of the causal link.

**Analysis of The Problems Identified in Chapter 5****Table 1 - Analysis of Problems and Their Impacts**

---

**Any analysis is unlikely to be an entirely objective attempt to allocate the cause of delay between the various participants. Most analyses are one sided with, at best, a cursory attempt to consider concurrent causes.**

---

**Nature of Problem**

May affect choice of analysis method.

Will the approach produce an objective analysis.

Must be accomodated by the method of analysis.

If an analysis is incomplete its conclusions are open to question. Unless the defaults of the party making the claim are incorporated and explained the conclusions can always be attacked as biased.

**Impact on Process or Method of Analysis**

The method of analysis must identify all delaying factors.

**Details of How the Impact is to be Accomodated**

Proposed method requires the identification and inclusion of all delaying events.

---

**Any presentation is unlikely to observe the important distinction between the factual analysis and the subsequent contractual analysis. The methodology may, in the event, be dictated by the picture the analyst is trying create.**

---

**Nature of Problem**

May affect choice of analysis method.

Will the approach respect the distinction between factual and contractual analysis.

Must be accomodated by the method of analysis.

This will be achieved by keeping the two stages of the analysis separate and properly documenting the developmental steps taken in completing the contractual analysis.

**Impact on Process or Method of Analysis**

The contractual analysis must rationalise the delaying factors and identify those which affect the completion date and the party responsible.

**Details of How the Impact is to be Accomodated**

Proposed method requires the identification and inclusion of all delaying events and provides the facility to separate delays caused by different parties.



Analysis of The Problems Identified in Chapter 5

Table 1 - Analysis of Problems and Their Impacts

1	<b>Presentations are often poor. A clear demonstration of the effect of each delay is required. This is often confounded by over complex presentations. There is a temptation to try and include or reflect all the available data rather than only that which is relevant.</b>
---	---

Nature of Problem

- Must be accomodated by the method of analysis.
- Will the approach result in the production of a suitable presentation.
- This requires that the factual data is accurately portrayed in the analysis, that the analysis includes an explanation of how the breach caused the difference which has been identified between the planned and actual performance and that the analysis uses a proper critical path network to demonstrate the impact(s).

Impact on Process or Method of Analysis

- Selected approach must provide a clear and uncomplicated presentation.

Details of How the Impact is to be Accomodated

- Proposed process will lead to the production of a clear and uncomplicated presentation.

## **Appendix 5**

### **Validation of Satisfaction of Requirements**

Requirement	Comments	Reference
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## **2. Summary of the Legal Principles**

**2.2 To succeed with a delay claim it is necessary to:**

(a) establish that a delaying event has occurred;	Proposed method requires that the factual basis of claim be set out	5.1 (f) & 5.37 (a)
(b) establish that the delaying event is:		
(i) a matter which gives rise to an entitlement to an extension of time under the contract; or	Proposed method requires that the contractual basis of claim be set out	5.1 (f) & 5.37 (b)
(ii) a breach of contract;	Proposed method requires that the contractual basis of claim be set out	5.1 (f) & 5.37 (b)
(c) establish that the delaying event caused delay to the project and to the completion date;	Proposed method requires the identification and inclusion of all delaying events.	5.24
(d) establish the extent of the delay.	Proposed method requires impact on completion date to be demonstrated	5.24 (d) (v)

**2.3 The Schedule Impact Analysis is required to meet the following evidential burdens:**

(a) establish what the project duration and completion date would have been had the delaying event not occurred.	Proposed method requires verification of the original plan.	5.22
(b) establish the critical path which determines the project duration and completion date;	Proposed method requires verification of the original plan.	5.22 (c)
(c) demonstrate the period by which the critical path was extended by each delaying event.	Proposed method requires impact on completion date to be demonstrated	5.24 (d) (v)
(d) demonstrate the total period by which the critical path was extended by all delaying events;	Proposed method requires that an As-Achievable Chart be produced	5.24
(e) resolve issues of concurrency.	Proposed method resolves concurrency	3.6 & 5.31
It follows from items (b), (c) and (d) that a critical path analysis is required.	Proposed method requires the use of critical path analysis	5.22 (c)



Requirement	Comments	Reference
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### 3. Summary of the Theoretical Concepts

<p>3.1 The work in Chapter 2 identified that the analyst has a choice of approach. The choice is between a delay analysis which is:</p> <p>(a) prospective ;</p> <p>(b) contemporaneous ; or</p> <p>(c) retrospective .</p>	<p>Proposed method recommends that the analysts use the retrospective approach but requires the analyst to consider the options and adopt the most appropriate approach</p>	<p>3.2 &amp; 5.1 (b)</p>
<p>3.2 These approaches are identified and analysed in detail in Chapter 2, that detail is not repeated here. Each approach is capable of establishing the impact of a delaying event:</p>	<p>This paragraph contains reasoning and analysis</p>	
<p>3.3 The analysis should account for all differences between the planned and actual performance.</p>	<p>Proposed method requires the identification and inclusion of all delaying events.</p>	<p>5.24</p>
<p>3.4 The calculation of delay must be made by reference to the impact on the completion date not to any intermediate date or activity .</p>	<p>Proposed method requires impact on completion date to be demonstrated</p>	<p>5.24 (d) (v)</p>
<p>3.5 There are three types of delay:</p>	<p>This paragraph contains reasoning and analysis</p>	
<p>3.6 The calculation of delay entitlement must take account of the matter of concurrency. Although this proposal uses a ‘netting off’ approach to the resolution of concurrency, regard must be had to any contractual provisions .</p>	<p>This paragraph contains reasoning and analysis</p>	

Requirement	Comments	Reference
-------------	----------	-----------

#### **4. The Problems Found in Practice and their Solutions**

4.5 The following notes are a distilled version of the data contained in Table 2 of the Appendix.

(a) There is a need to understand what information is available before confirming the approach:

- |  |   |         |
|--|---|---------|
| (i) The nature of the approach may be limited to prospective analysis if there is no contemporaneous performance data available. | The proposed process requires the analyst to identify what information is available before confirming the method of analysis. | 5.1 (a) |
| (ii) There is a need to consider timing of analysis in relation to availability of remote party documents.                       | The proposed process requires the analyst to identify what information is available before confirming the method of analysis. | 5.1 (a) |

(b) The method of analysis must be suitable for the nature of the particular project and its delaying factors before selecting approach:

- |   |   |            |
|---|---|------------|
| (i) The nature of the problem will dictate level of detail used in the analysis and/or use of time windows; | Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before confirming method of analysis: | 5.1 (a)    |
| (ii) Separate critical paths will need separate analysis;   | • Proposed method will facilitate the use of layered analysis or analysis within time windows;  | 5.7        |
| (iii) Separate analysis may be required for each party.   | • Proposed method will allow the use of parallel analyses;  | 5.7 & 5.25 |
|   | • Separate As-Impacted plans can be produced to reflect the liability of each party.  | 5.25       |

(c) Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.	Proposed method is not limited to use with any particular project management software package.
--	--

(d) Choice of approach may be limited to a prospective analysis if time and/or financial constraints are paramount.	Proposed process requires the analysts to obtain an appreciation of the project and its particular nature and problems before confirming the method of analysis.	5.1 (a)
---	--	---------

Requirement	Comments	Reference
(e) The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable Chart.	Proposed method requires verification of the original plan.	5.22
(f) Where a large amount of complex data is involved the analysis may have to be layered (use of a number of levels of analysis) or the project will have to be analysed in a number of discrete time periods (window analysis).	Proposed method will facilitate the use of layered analysis or analysis within time windows.	5.7
(g) The method of analysis must identify all delaying factors.	Proposed method requires the identification and inclusion of all delaying events.	5.24
(h) The contractual analysis must rationalise the delaying factors and identify those which affect the completion date and the party responsible.	Proposed method requires the identification and inclusion of all delaying events and provides the facility to separate delays caused by different parties.	5.24 & 5.25
(i) Selected approach must provide a clear connection between the alleged breach of contract and the impact on completion.	Proposed process will provide proper identification of the causal link.	5.1 (e) & (f)
(j) Selected approach must provide a clear and uncomplicated presentation.	Proposed process will lead to the production of a clear and uncomplicated presentation.	5.36 & 5.37



## **Appendix 6**

### **Enquiry Letter and Brief Questionnaire**

# **TEXT BOUND INTO THE SPINE**

3 November 1998

Dear

**PhD Research Thesis - Loughborough University of Technology**

**The Use of Computer Scheduling Techniques in the Evaluation of Time  
Claims In Construction Projects**

I am currently concluding a work of research which is seeking to identify an approach to the proof of delay claims which will be widely acceptable within the UK.

I have been working on this project for more than five years and will be presenting the findings in a written thesis shortly. This will form a submission to Loughborough University of Technology (Civil and Building Engineering Department) in part fulfilment of their requirements for the award of a PhD.

The full work comprises some 70,000 words.

The purpose of this letter is to ask you to comment on the conclusions which I have drawn from the research. In this respect I have enclosed a copy of Chapter 6 of the thesis which includes the conclusions by way of a proposal for an approach to the analysis of delay claims. This proposal seeks to make good the hypothesis that:

*'An effective approach to the analysis of delay claims which satisfies UK legal precedents and practical constraints can be identified by using US practice and legal precedents as a model.'*

I believe that the proposal set out in the enclosed Chapter 6 meets this aim.



I have prepared a brief questionnaire which indicates the areas in which comments are sought. I would be grateful if you could find the time to review the text of Chapter 6 and complete the questionnaire. If you are unable to complete the questionnaire any general comments you are able to provide would be appreciated.

If there are any particular points which are unclear in Chapter 6 I would be happy to explain them in more detail. I am happy to discuss any queries by telephone or by way of a meeting if you would prefer.

It would be a great help to me if you could let me have your comments by 27 November, 1998.

If you would like any further general information in respect of my research please let me know.

A stamped addressed envelope is enclosed for your reply.

Yours sincerely,

Mike Standinger

**Questionnaire**

**1. The Legal Principles**

**1.1** Would you say that the explanation of the legal principles as set out in Section 2 is:

- (a) comprehensive ☐
- (b) adequate ☐
- (c) poor ☐

**1.2** Are there any further matters of principle which, in your view, ought to be included?

- (a) yes ☐
- (b) no ☐

If yes please specify:.....  
.....  
.....  
.....

**2. Theoretical Concepts**

**2.1** Would you say that the explanation of the theoretical concepts as set out in Section 3 is:

- (a) comprehensive ☐
- (b) adequate ☐
- (c) poor ☐

**2.2** Are there any further concepts which, in your view, ought to be included?

- (a) yes ☐
- (b) no ☐

(c) If yes please specify:.....  
.....  
.....  
.....

**3. Problems of Application**

**3.1** From your experience of dealing with delay claims are there any particular problems which the approach should be designed to accommodate which are not included in Section 4?

(a) yes ☐

(b) no ☐

If yes please specify:.....  
.....  
.....  
.....

**4. The Proposed Approach**

**4.1** Would you say that the proposed approach to delay analysis as set out in Section 3 is:

(a) comprehensive ☐

(b) adequate ☐

(c) poor ☐

**4.2** Are there any further matters which ought, in your view, to be included?

(a) yes ☐

(b) no ☐

If yes please specify:.....  
.....  
.....  
.....



# **The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects**

## **Chapter 6 Proposal**

### **CONTENTS**

1. Introduction
2. Summary of the Legal Principles
3. Summary of the Theoretical Concepts
4. The Problems Found in Practice and their Solutions
5. The Proposed Approach
6. Summary of Chapter 6

# **The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects**

## **Chapter 6 Proposal**

### **1. Introduction**

**1.1** Chapter 6 will develop a proposal for an approach to delay analysis and the proof of time entitlement which incorporates US practice and legal precedents and satisfies UK legal precedents and practical constraints. The research has identified three key requirements:

- (a)** compliance with the legal principles set out in Chapters 2 and 3;
- (b)** compliance with the theoretical concepts set out in Chapters 2 and 3;
- (c)** incorporation of the points arising out of the rationalisation of the practical problems of application identified in Chapter 4 and distilled in Chapter 5.

**1.2** Section 2 will restate and summarise the legal principles and their application to the formulation of an approach to delay analysis.

**1.3** Section 3 will restate and summarise the theoretical concepts and their application to the formulation of an approach to delay analysis.

**1.4** Section 4 will review the practical problems which are distilled in Chapter 5 and identify their potential impact on the formulation of the approach to delay analysis. The exploration and analysis of the practical problems is carried out in Appendix ... hereto. Section 4 will summarise the points arising out of that exploration and analysis.

**1.5** Section 5 will describe the proposed process for completing a time analysis of a construction project which incorporates the legal principles and the theoretical concepts and accommodates the practical problems of application.

# **The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects**

## **Chapter 6 Proposal**

### **2. Summary of the Legal Principles**

**2.1** The analysis in Chapters 2 and 3 identified a number of legal principles.

**2.2** To succeed with a delay claim it is necessary to:

- (a)** establish that a delaying event has occurred;
- (b)** establish that the delaying event is either:
  - (i)** a matter which gives rise to an entitlement to an extension of time under the contract; or
  - (ii)** a breach of contract;
- (c)** establish that the delaying event caused delay to the project and to the completion date.

The final presentation of the delay analysis will provide an answer to all these matters. Items (a) and (b) are matters of fact and the Courts have identified the nature and extent of the evidence which is required to establish an entitlement to additional time. Schedule Impact Analysis is primarily required to provide the answer to item (c).

**2.3** The Schedule Impact Analysis is required to meet the following evidential burdens:

- (a)** establish what the project duration and completion date would have been had the delaying event not occurred.

There is no evidential presumption that any tender, contract or other contemporaneous programme should form the basis of any claim for delay. Thus it is essential to establish, by objective



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evidence, what the completion date would have been had the delaying event not occurred;

- (b) establish the critical path which determines the project duration and completion date;
- (c) demonstrate the period by which the critical path was extended by each delaying event.

The presentation of time claims on a global basis is not categorically supported by the cases which are often quoted in support of that general proposition. The Courts have shown a preference for a detailed, logical analysis over the impressionistic approach. Thus the need for a structured approach is established;

- (d) resolve issues of concurrency.

In many cases the approach to concurrency can be derived from the contractual provisions. Thus the wording of the JCT 80 Standard Form of Contract, arguably, allows the contractor an extension of time where a delaying event has occurred whether there has been concurrent delay by the contractor or not. Application of the separate provisions relating to compensation, which do not exclude the concept of concurrent causes, is likely to result in the contractor being compensated for a lesser period.

It follows from these principles that a critical path analysis is essential to establish delay to completion.

- 2.4 Items (a) and (b) are resolved by the production of an As-Achievable plan. Item (c) is resolved by the production of an As-Impacted plan. Item (d) the matter of concurrency, is resolved by the production of the employer

# **The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects**

## **Chapter 6 Proposal**

and contractor responsible As-Impacted plans and the formula used to calculate the excusable and excusable, compensable delays.

### **3. Summary of the Theoretical Concepts**

3.1 The work in Chapter 2 identified that the analyst has a choice of approach. The choice is between:

- (a) prospective;
- (b) contemporaneous;
- (c) retrospective delay analysis.

3.2 Each of these approaches is identified and developed in detail in Chapter 3, that detail is not repeated here. Each approach is capable of establishing the impact of a delaying event:

- (a) The prospective approach has a lesser probative value than those approaches which take account of actual performance. The prospective approach may be appropriate in circumstances where an employer is faced with defending a poorly particularised delay claim, where an answer is required in advance of, or in the absence of disclosure of relevant information or where there is no as-built performance data available. This approach may also be appropriate where there are severe time or financial constraints;
- (b) Although the contemporaneous approach is considered by many to be evidentially superior to the others and is widely used in the US it is inconsistent with the approach to construction project planning found in the UK. Unless implemented during

# The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects

## Chapter 6 Proposal

performance, reconstruction after the event would be prohibitively expensive;

- (c) The retrospective approach is identified as being the most appropriate.

### 3.3 There are three types of delay:

- (a) excusable delay. Delay for which the contractor is entitled to an extension of time and relief from liquidated damages but no compensation to the contractor. Usually relates to shared risks;
- (b) excusable, compensable delay. Delay for which the contractor is entitled to an extension of time, relief from liquidated damages and compensation. Usually relates to risks accepted by and fault on the part of the employer;
- (c) culpable delay. There is no entitlement to either an extension of time or compensation (sometimes referred to as non-excusable, non-compensable delay). Relates to risks accepted by, and fault on the part of, the contractor.

### 3.4 The analysis should account for all delaying events.

### 3.5 The calculation of delay must be made by reference to the impact on the completion date not to any intermediate date or activity. Delay entitlement should be calculated as follows:



# The Use of Computer Scheduling Techniques in the Evaluation of Time Claims In Construction Projects

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- (a) excusable delay is calculated by taking the difference between:
  - (i) the original contract completion date, or the completion date calculated on the As-Achievable plan, whichever is the later; and
  - (ii) the completion date calculated on the As-Impacted plan including employer responsible delays, or the actual completion date, whichever is the earlier.

- (b) the period of excusable, compensable delay is calculated by taking any positive difference between:

- (i) the original contract completion date or the completion date calculated on the As-Impacted chart including contractor responsible delays, whichever is the later; and
- (ii) the completion date calculated on the As-Impacted chart including employer responsible delays, or the actual completion date, whichever is the earlier.

With the prospective approach it is possible that the completion date calculated on the As-Adjusted plan including employer responsible delays will be later than the actual completion date. If this is the case the contractor may be entitled to recover acceleration costs.

- (c) The period of culpable delay is the difference between the overall period of delay and the excusable period of delay.

This proposed method of analysis takes a broad view of concurrency. Analysis of the position taken by a number of commentators indicates that

Chapter 6 Proposal

this the most appropriate method of resolution. It is considered that this approach is correct and any approach which seeks to match and discount individual delays by time frame or other selective criteria is artificial.

4. The Problems Found in Practice and their Solutions

4.1 The problems found in practice and their solutions are analysed in Appendix ... Appendix ... includes two tables:

- (a) Table 1 Analysis of Problems and Their Impacts;
- (b) Table 2 Analysis of Impacts and Their Accommodation.

4.2 Table I lists the 20 problems set out in paragraph 11.1 of Chapter 5 and explores their nature in the context of the three types of problem identified in paragraph 11.2 of Chapter 5. Using that information solutions to the individual problems are developed and their impact on the process or method of analysis is identified.

4.3 Table 2 rationalises the solutions and their impacts, sorts the results into the order in which they are likely to be encountered/need to be resolved during the prices of analysis and removes the duplicates. The table also identifies the way in which the results are accommodated in the proposed analysis process.

4.4 The following notes are a distilled version of the data contained in Table 2 of the Appendix. The notes in bold are the potential impacts on the process or method of analysis and the notes in italics are the details of how the impacts are accommodated in the proposal. The sub-paragraph

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numbering corresponds with the numbering in Table 2:

- (a) **There is a need to understand what information is available before selecting the approach:**
  - (i) **The nature of the approach may be limited to prospective analysis if there is no contemporaneous performance data available.**
  - (ii) **There is a need to consider timing of analysis in relation to availability of remote party documents.**

*The proposed process requires the analyst to identify what information is available before selecting method of analysis.*

- (b) **The method of analysis must be suitable for the nature of the particular project and its delaying factors before selecting approach:**
  - (i) **The nature of the problem will dictate level of detail used in the analysis and/or use of time windows;**
  - (ii) **Separate critical paths will need separate analysis;**
  - (iii) **Separate analysis may be required for each party.**

*Proposed process requires the analyst to obtain an appreciation of the project and its particular nature and problems before selecting method of analysis:*

- *Proposed method will facilitate the use of layered analysis or analysis within time windows;*



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- *Proposed method will allow the use of parallel analyses;*
- *Separate As-Impacted plans can be produced to reflect the liability of each party.*

- (c) **Need to select approach which uses normal planning practice and tried and tested planning methods and provides a clear presentation.**

*Proposed method is not limited to use with any particular project management software package.*

- (d) **Choice of approach may be limited to a prospective analysis if time and/or financial constraints are paramount.**

*Proposed process requires the analysts to obtain an appreciation of the project and its particular nature and problems before selecting method of analysis.*

- (e) **The selected method of analysis must include either verification of the original plan or the production of an objective As-Achievable plan.**

*Proposed method requires verification of the original plan.*

- (f) **Where a large amount of complex data is involved the analysis have to be layered (use of a number of levels of analysis) or the project will have to be analysed in a number of discrete time periods (window analysis).**

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*Proposed method will facilitate the use of layered analysis or analysis within time windows.*

- (g) The method of analysis must identify all delaying factors.**

*Proposed method requires the identification and inclusion of all delaying events.*

- (h) The contractual analysis must rationalise the delaying factors and identify those which affect the completion date and the party responsible.**

*Proposed method requires the identification and inclusion of all delaying events and provides the facility to separate delays caused by different parties.*

- (i) Selected approach must provide a clear connection between the alleged breach of contract and the impact on completion.**

*Proposed process will provide proper identification of the causal link.*

- (j) Selected approach must provide a clear and uncomplicated presentation.**

*Proposed process will lead to the production of a clear and uncomplicated presentation.*

**Chapter 6 Proposal**

**5. The Proposed Approach**

**5.1** In order to produce an analysis which will fulfil the three key requirements the analyst should work through the following stages:

- (a)** obtain general appreciation of project;
- (b)** establish a strategy and select an appropriate method of analysis;
- (c)** read documents;
- (d)** assemble data;
- (e)** complete the network analysis and the delay analysis;
- (f)** document delays and prepare presentation.

**Obtain General Appreciation of Project**

**5.2** It is important to obtain a good appreciation of the nature of the project to be analysed and of its particular characteristics before determining the method of analysis to be used and planning further work. The following should be done:

- (a)** identify what documentation and other information is available;
- (b)** identify original programme(s), method statement(s), revised programme(s) and progress data;
- (c)** identify contract documents and establish whether there are any particular requirements regarding scheduling and in respect of entitlement to extension of time and notice;



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- (d) identify what notice(s) of delay have been given;
- (e) identify what applications for extension of time have already been made and any response thereto;
- (f) identify what analysis of performance, if any, has already been carried out;
- (g) identify claims made by or against sub-contractors or other third parties as appropriate and any response thereto;
- (h) interview project participants.

**5.3** It is important to understand what has already been done and what material is available. Obviously only an impression of the particular difficulties encountered on the project can be obtained at this stage. An analyst would be unwise to commit himself to either a timetable or a budget for the work without obtaining this general appreciation.

**Establish a Strategy and Select an Appropriate Method of Analysis**

**5.4** What is required is to decide on the approach which will be used and establish the strategy for reading the documents and collecting the necessary data.

**5.5** On small projects this may only take a few hours. On a major project it may take a week or more to complete this appraisal. Some analysts will carry out the initial appraisal and produce a brief report setting their initial impression of the merits of the case and proposals for further work for a lump sum fee.

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- 5.6 The choice of approach will, to some extent, be informed by the data available. It would be no good for example making a total commitment to the contemporaneous approach if there was no regular progress data available. It would be impossible to complete either a contemporaneous or retrospective analysis without as-built data.
- 5.7 In reality, however, the choice is limited to one between:
- (a) the prospective approach; and
  - (b) the retrospective approach.
- 5.8 The retrospective approach should be used in preference to the prospective approach. The prospective approach may be appropriate:
- (a) where an employer is faced with defending a poorly particularised delay claim;
  - (b) where an answer is required in advance of or in the absence of disclosure of relevant information;
  - (c) where there is no as-built performance data available;
  - (d) where there are severe time or financial constraints.
- 5.9 The analyst appointed to advise on the production and prosecution of delay claims should explain the alternative approaches available and their relative strengths and weaknesses to the potential litigant and his legal advisers so that they may understand the choice and be involved in the selection.

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**Read Documents**

- 5.10 Here the aim is to collect together the factual material required to explain and support the complaints.
- 5.11 On a large construction project the amount of documentation will be enormous and it would not be possible to read everything. It is therefore necessary to be selective about which documents are read and to carefully plan the reading.
- 5.12 The extent of reading will be dictated by the time available, how well the causes of delay have been identified during construction and the adequacy of record keeping generally. Time ought not to be, but often is, a limiting factor. The potential litigant should be discouraged from setting too tight a budget or timescale but these are often commercial realities. As to the extent to which it is safe to concentrate on the delay topics which have already been identified this is a matter for the judgement of the analyst. Again the potential litigant should be discouraged from attempting to limit the scope of enquiry of the analyst but, again, this is often a commercial reality.
- 5.13 As documents are read notes should be taken of any important points and matters of detail. The notes should be entered into a database<sup>1</sup> together with details of the document reference, nature of the document, date, who generated the document, who it was sent to, etc. As the reading progresses a list of topics will develop and the various notes should be allocated or cross referenced to the various topics. It is not necessary to slavishly copy out the text of every important document but the aim should be to enable any subsequent reader of the note to understand the

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<sup>1</sup> The author first used a database system to analyse project complaints in 1989. Since 1989 a sophisticated database system has been developed by Chris Ennis which is used on all forensic



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point without having to refer to the actual document. With developments in imaging technology the scanning of whole documents has become viable. There remains however the need to be selective about the documents entered. It is still difficult<sup>2</sup> to scan documents in a way which enables them to be directly interrogated and searching of documents still tends to rely on the separately data-based notes of key words dates etc. Unfortunately the ability to scan-in huge quantities of data may create a less rather than more accessible data set.

- 5.14 Once notes are stored in the database they can be easily retrieved, sorted and displayed. Date sorted notes under topic headings provide an ideal base from which to develop descriptive narrative for the various delay topics.

**Assemble Data**

- 5.15 The aim is to collect together the data required to carry out the various analyses which are required.
- 5.16 As-built activity dates, progress data, information about quantities of work, variations, instructions and issue of drawings, etc, dates of key events, weather records and other such data will be required. It is important for the analyst to identify the best source of such data but its collection can be delegated to junior staff or may be undertaken by the potential litigants own staff. It obviously saves time if the collection of data can proceed in parallel with the general reading.

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work carried out by the author's company. The notes which form the basis of the work in Chapters 2, 3 and 4 of this thesis were collected and analysed in this way.

<sup>2</sup> The main difficulty is to some extent computer storage space.

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- 5.17 For as-built dates a schedule<sup>3</sup> should be prepared showing start and finish dates and giving a source reference. Where there are a number of competing dates available for a particular activity the alternatives should be noted and a reason given for the selection finally made.
- 5.18 Overall start and finish dates may not be sufficient on their own. Where there are periods of low productivity this should be noted. This is often best achieved by noting the percentage of the work completed each week. Some planning software packages allow this data to be printed out on the bar chart.
- 5.19 Progress data is often difficult to summarise and is often not comprehensive. It is important to take a view on what is available prior to selecting a method of analysis and the level of detail in which it is intended to work. The availability of such data may restrict the selection.

**Network Analysis and Delay Analysis**

- 5.20 This stage will produce the Schedule Impact Analysis.
- 5.21 The prospective and retrospective approaches require different charts to be produced.
- 5.22 For a prospective analysis there will normally be three network charts to produce:
- (a) The As-Achievable plan;
  - (b) The As-Impacted plan - Employer Responsible Delays;

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<sup>3</sup> Some planning software packages allow this to be included in the same data files as the activity data, or in data files linked to the activity data files. OpenPlan, for example, is based on a database program and additional fields can be added to include information on actual start and finish dates.

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(c) The As-Impacted plan - Contractor Responsible Delays.

5.23 The As-Achievable plan is a programme which calculates the completion date which would have been achievable absent delays caused by either party:

(a) An As-Achievable plan will need to acknowledge many things and may not correspond either with the contractual completion date or the contractors original plan;

(b) An As-Achievable plan may, subject to proof of adequacy, be based on the contractors original plan or on a plan produced after the event;

(c) The As-Achievable plan should be a network which comprises finish to start relationships, without any fixed restraining dates and which shows the critical path through the project.

5.24 The two As-Impacted plans are produced by taking the As-Achievable plan and incorporating into it additional activities and logic constraints to represent the delaying events. The As-Impacted - Employer Responsible plan will incorporate those delaying events which are the responsibility of the employer. The As-Impacted - Contractor Responsible plan will incorporate those delaying events which are the responsibility of the contractor.

5.25 For the retrospective analysis it will be necessary to produce five network charts:

(a) The As-Achievable plan;

(b) The As-Built plan;



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- (c) The As-Impacted plan including all delays;
- (d) The As-Impacted plan - employer responsible delays;
- (e) The As-Impacted plan - contractor responsible delays.

5.26 The As-Achievable plan is produced in the same way as for the prospective analysis.

5.27 The As-Built plan is assembled using the as-built data:

- (a) The As-Built plan will follow as closely as possible the logic and sequence of the As-Achievable plan:
- (b) The As-Built plan will show how the project was actually constructed and demonstrate the total time taken in fact and locate the actual critical path;
- (c) In order to make a valid comparison it is essential that the As-Built data is compatible with the As-Achievable plan. This can only be achieved by ensuring that the As-Achievable plan anticipates the quality and extent of As-Built data available. Any variations between the As-Achievable and the As-Built will have to be identified and explained as part of the As-Impacted plan;
- (d) As a basic minimum, start and finish dates for each activity are required.
- (e) The As-Built plan should, as far as possible, be a network which comprises finish to start relationships, without any fixed restraining dates and which shows the critical path through the project.

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**5.28 The As-Impacted plan including all delays. This plan will be derived from the As-Built plan:**

- (a) if not already completed as part of the As-Built plan:**
  - (i) detail points where the As-Built conforms with the As-Planned;**
  - (ii) detail points of variance;**
  - (iii) explain actual durations and sequences where at variance with the plan;**
  - (iv) locate the actual critical path.**
- (b) adjusting the activity durations and/or adding additional activities and logical relationships in order to explain all of the differences identified in (a).**
- (c) Provide an explanation in respect of each of the differences identified on the As-Impacted plan.**
- (d) The analysis is required to identify:**
  - (i) activities affected by delay;**
  - (ii) the time span of each delay;**
  - (iii) changes in sequence;**
  - (iv) the nature of the delay;**
  - (v) impact on completion date.**

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- (e) Each delay can be colour coded and fully documented and explained with appropriate references to contract documents and project records.
- 5.29 The As-Impacted plan will be used to prepared the employer/contractor responsible As-Impacted plans.
- 5.30 The As-Impacted - Employer Responsible plan will be produced by removing all delays other than those for which the employer is responsible.
- 5.31 The As-Impacted - Contractor Responsible plan will be produced by removing all delays other than those for which the contractor is responsible.
- 5.32 Once the various charts are completed the entitlement to excusable and excusable, compensable delay are calculated.

**Document Delays and Prepare Presentation**

- 5.33 The presentation will take the form of a report and consist of a summary chart or charts which graphically demonstrate the delays and their impact and a narrative which documents the individual delays and explains the process of analysis undertaken. The charts and their explanation produced as part of the Schedule Impact Analysis will be appended to the report.
- 5.34 Although the analysis may be based upon a computer network planning system the results will likely best be graphically presented in bar chart form. The bar charts should be supported by a data listing of the activity data which identifies the logical relationships between activities.
- 5.35 The graphical presentation must be capable of demonstrating:



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- (a) which activities and delaying events are critical;
- (b) the critical path through the project as a whole;
- (c) the impact of each cause of delay;
- (d) the interaction of alternative or competing causes.

5.36 The method of producing the summary chart or charts will be dictated by the method and extent of analysis. Where the analysis is simple the As-Impacted plans may be sufficient for the final presentation.

5.37 If the As-Impacted plans are complicated and contains a lot of supporting data it may be preferable to abstract the relevant data to provide a clear and concise summary chart which includes the key causes of delay. This should not however be used as an excuse to manipulate the results.

5.38 The narrative should fulfil evidential expectations of the Courts. Each delaying event should be documented to provide the following information:

- (a) particulars of the term(s) of contract under which the allegation of delay is made, including details of any notice required and provided;
- (b) details of the delaying event including, the date upon which, or dates between which, the event occurred, and an explanation of the relevant facts of the delaying event including, reference to particular drawings, instructions, variations, etc;
- (c) if the delaying event was caused or contributed to by more than one party, details of each contribution;

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- (d) details of the principal work activities delayed and the activities affected by the delaying event including:
  - (i) identification number and description;
  - (ii) planned and actual start and finish dates
  - (iii) planned and actual duration;
  - (iv) the delay, disruption or other impact caused to the activity by the delaying event.
- (e) if the work activities were delayed by more than one delaying event, details of the contribution of each;
- (f) overall impact of the delaying event on the project completion date (critical path);
- (g) the amount of loss claimed.

**6. Summary**

- 6.1 Section 2 summarised the legal principles set out in Chapters 2 and 3 and their application to the formulation of the analysis method.
- 6.2 Section 3 summarised the theoretical concepts set out in Chapters 2 and 3 and their application to the formulation of an analysis methodology.
- 6.3 Section 4 and Appendix .. explored and analysed the solutions to the practical problems distilled in Chapter 5. The application of the solutions to the formulation of an analysis methodology was also analysed.

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- 6.4 Section 5 sets out the proposed process for completing a time analysis of a construction project.
- 6.5 Chapter 7 will summarise the findings of the research and include the validation of the proposed process. Chapter 7 will also set out recommendations for further research.