MANAGING THE RISK OF DELAYED COMPLETION IN THE 21ST CENTURY: THE CIOB RESEARCH

A paper presented to a meeting of the
Society of Construction Law
in Milton Keynes on 1st October 2009

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November 2009

D106

www.scl.org.uk

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Introduction

Just over nine years ago, at a meeting of the Society in London, a group of members got together to discuss the way delay issues were handled by both the parties and the courts, with a view to making the resolution of delay-related disputes more predictable. About two years later, in October 2002, the *Delay and Disruption Protocol* was published.[1] The thesis propounded was that if the impact of events could be impacted upon a network programme that was up to date at the time, the effect could be calculated and measured instead of guessed; further, this would be greatly to the advantage of everyone concerned with delay in construction contracts.

Notwithstanding the obvious advantages, the industry did not take this message to heart. Contract drafting bodies ignored it and unfortunately 'the Protocol', as it became known, was used more often as a stick with which to beat the opposition in disputes, rather than to avoid disputes in the first place.

During the last 20 years or so, it is apparent that the industry has also experienced increasing demand for:

- design and build, guaranteed maximum price and engineer, procure and construct contracts that require the contractor to take more risk;
- specially incorporated companies as employer for a particular project which will have limited access to additional funds and are intended to be liquidated once their purpose is fulfilled;
- efficient and technologically complex solutions, in shorter time scales and within tighter financial constraints;
- accurate completion dates.

This, perhaps, makes it all the more surprising that the recommendations of the Protocol were not taken more seriously. It is clear that when time has not been managed effectively, and there is a combination of constraints such as those above, the consequences can be devastating for all participants on a project. But it is not just the employer, consultants, contractors and suppliers that suffer as a result of mismanagement of time: the £150m spent in

1 *The Society of Construction Law Delay and Disruption Protocol* (Society of Construction Law, October 2002, www.eotprotocol.com).

prolongation costs on the Scottish Parliament building would have funded a fully equipped general hospital. So whilst for many private developers profit and loss on the bottom line are the primary driving forces, for public authorities getting value for money and not frittering it away on the costs of mismanagement are equally important.

For the last 30 years or so, construction management has been the Chartered Institute of Building's (CIOB's) cornerstone policy for improvement of the construction industry. Conscious of several high profile disastrous failures in time management over the years since the Protocol was published, and with a view to examining the state of the industry in this field, between December 2007 and January 2008, the CIOB conducted a survey of the industry's knowledge and experience of different methods of project control and time management.

The thesis underpinning the research was that, despite the advice of the Protocol and availability of advanced computerised facilities, little had changed in the practice of time management since the development of the bar chart, nearly 100 years ago. The essence of the research was thus to understand industry performance, the techniques used and the competence of those engaged in the process of time management. As far as the CIOB can ascertain, this is the first research of its kind.

The survey required the respondents to submit commercially sensitive information. Four hundred companies were approached and 73 responses received, just under half of which were anonymous. However it is reasonable to assume that only one response was received from each company. The report is based on data provided on nearly 2,000 projects over a three year period.[2]

The conclusions of the CIOB report

The survey shows that simple, repetitive, low-rise projects have a high chance of success within the traditional, intuitive, management processes. However, the more complex the project, the less likely it is that intuitive management will be sufficient to achieve completion on time. Without a scientific approach to time management, complex buildings (low rise and high rise) and engineering projects are likely to be substantially delayed in their completion.

The quality of time management on complex construction projects was generally found to be poor. Over half of the respondents used only a master programme with no short term planning, and the programmes were normally bar charts without linked sequencing. Managers were therefore unable to measure the impact of slippage, or imposed changes to the works, and hence were unable to manage the effects of the delay to the rest of the works and on project completion, except intuitively.

Time control, if any, was left to the contractor. Further, in the formulation of programmes, there appeared to have been little collaborative discussion with

2 The full report is available from www.ciob.org.uk.

project participants, including subcontractors and suppliers. In a third of all cases the contractor's programmer developed programmes alone. The basis of the master programme was not therefore based on the collective experience of the project team. Programmes were not generally coupled with thought out, written method statements and were not as systematic in their preparation as might reasonably be expected.

There was little effective management of time using network-based programming. Resource, cost and value allocation to programmes was a minority exercise and there was no effective quality assurance process in place for the preparation and maintenance of the programme. Too often programmes were used solely as a political tool to protect companies and management from accusations of blame for delays; whereas they should have been regularly updated tools used for the purpose of managing sequence and progress and to minimise the consequence of delays.

The recording of progress against plans was generally not systematic. It is apparent that, for the majority of respondents, it became a matter of guess-work. Many respondents had experience of progress not being reported in meetings, nor in correspondence. In many instances, progress was measured against programmes that were not regularly updated, with no understanding of the effect that preceding events had had on successive activities or their impact on the overall project. Thus any reporting was relatively meaningless.

In many instances, delays to progress were not recognised at all until programmes had been updated. If demonstration were needed, this highlighted the importance of the recommendations of the Protocol in regard to updating the programme and project control.

However there appeared to be a reluctance to face the consequences of delay. Only a fifth of respondents said they would voluntarily declare a delay to progress, even if the contract required it. Nearly half the respondents did not report a delay because they might be able to get over it; a third did not want to upset the client; a tenth admitted they might be able to blame someone else. Not only did the results show a failure of project control, issues of relationships, transparency and even deceit arose.

As to the incidence of delayed completion on different procurement routes, there was no discernable difference between the contract forms. Neither the standard forms nor bespoke contracts appeared to have had the effect of promoting or encouraging efficient time management. Perhaps as a result of the use of contracts that were punishing if not executed efficiently, the majority of delay related costs were perceived to be predominately at the risk of the contractor.

The research revealed that the growth in training, education and skill levels of the industry in the use of time management techniques has not kept pace with the technology available. 95% of the respondents thought that the standard of education and training in the management of time was unsatisfactory. This might be the reason why the recommendations of the Protocol have not been taken up more widely.

In the light of the results of the research and with a view to reducing the incidence of delayed projects, the CIOB has set in motion a four stage initiative to provide:

- a practice standard in the management of time;
- education and training in the application of that standard;
- qualifications for those whose abilities deserve recognition; and
- education and training to employers, consultants and others in the industry who want to know how time can be managed pro-actively, instead of letting projects fail and then arguing about who pays for the failure.

An historical perspective on time management

The age of cost control and contracts began in the 1860's when, for the first time, quantities were taken from drawings, prepared before construction commenced. Nothing like it had ever before been possible.

It was the CIOB and Royal Institute of British Architects (RIBA) together who produced the first standard form of contract and stimulated the birth of the Joint Contracts Tribunal in 1870. However, this was 40 years before what we now call the bar-chart was invented. There was no concept then of a scientific approach to time control and little has changed since then in the administrative approach to time in contracts.

Although the process of quantifying the works to be built and establishing a price thus started towards the end of the 19th century, it was to be another 50 years before the first attempt was made to standardise the method of measurement, with the publication of the Standard Method of Measurement 1 (SMM1), in 1922. From that flowed another 50 years of trying to control time by reference to cost.

By the 1960's it was recognised that unless time could be controlled, cost never could be. At about the same time, two unconnected conceptual processes were developed as possible solutions to the problem. First, the device of the critical path network (which could be used to predict consequences) was invented. Secondly, it was thought that by having a greater input into relationships, information management and quality control of process, a project manager could do what cost control alone had failed to do. But it is now abundantly clear that control of relationships, information and quality alone will not secure completion on time, either.

By the 1980's, the favoured theory was that the failure to control time must be something to do with contractual relationships and, if projects were less adversarial, better results would be achieved. The Office of Government Commerce (OGC) published their Constructing Excellence industry guidance, the essence of which was that so long as the right procurement route was selected, completion on time would follow. To the myriad of standard forms and procurement methods then available, was added partnering and alliancing, and the New Engineering Contract. Each of these contracts had a different

regime for identifying risk and apportioning liability; although they all had a regime for controlling cost and quality, none identified how time was to be managed, nor by what standard.

Constructing Excellence key performance indicators (KPIs) have shown that since the adoption by government agencies of that contractual regime-orientated procurement process, construction time standards have either remained stagnant or declined.[3]

- In 1999, it was observed that of 66 government department construction projects (with a total value of £500m), two thirds had exceeded their completion date by 63%.[4]
- In 2005, it was reported that time predictability had worsened over the previous 12 months, with the proportion of government agency projects delivered on time or better falling from 49% to 44%.[5]
- In 2007, it was conservatively estimated that, since the first wave of schemes began in 1994, £100m had been lost to overruns on 40 major PFI hospital projects alone.[6]

If it was not apparent before, we now know that that the concept of managing time by selecting a particular procurement route will not work either.

The only consistency over the last 100 years or so, between all the attempts to manage time, is that they have all been based upon getting the contractor to devise a programme at the beginning of the job (in the form of a target) against which a failure to achieve it can be measured. Then reporting against any divergence, in the hope that improvement could be made in response to threats and/or financial encouragement.

This is at the root of the problems with time management. Historical reporting of failure to achieve a notional fixed target is not an effective way to manage time on complex projects. That is so, with or without threats or financial encouragement.

Neither is progress monitoring against a fixed target any use: whether the old 'count the squares' method (CTS) advocated by the UK government[7] (with or without weighted resource values) or the relatively new earned value analysis (EVA) method (which predicts success by reference to the balance of work valued as completed against the value of work predicted in the same period). Both have the same four short comings:

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3 *Construction Statistics Annual: 2008 Edition*, Table 16.2 'Summary of industry performance from 2004 to 2008 – Construction Industry KPIs', available from www.statistics.gov.uk.

4 Benchmarking and the Government Client Stage 2 Study 1999, quoted in *Achieving Excellence Guide 8: Improving Performance* (OGC, January 2003), page 6.

5 Report on Key Performance Indicators, released by Constructing Excellence 7th June 2005 (www.kpizone.com, Building magazine 7th June 2005).

6 *Building on success; the way forward for PFI* (Confederation of British Industry, June 2007; available from www.cbi.org.uk).

7 *Project Sponsorship: Planning and Progress Monitoring*, Guidance Note No 7 (Central Unit on Purchasing, HM Treasury, 1986).

- They are based upon a fixed target, the assumption being that if there is a departure from the target, it must be caused by a failure to make effective progress. However, if the content and sequence change (as in complex projects they are bound to) the target is rendered meaningless and the departure could be caused by anything;
- They cannot differentiate between critical and non-critical activities in a changing sequence and content;
- They do not identify cause and effect, nor separate liability for intervening events; and
- They cannot be used to pose solutions, nor to manage consequences.

Risk registers fulfil the useful purpose of cataloguing the pitfalls that may be encountered in the future. However, it is readily apparent that no matter how many risk registers are set up, and no matter how many times they are reviewed and revised, it is not possible to predict, for example: what plant will break down, or when; whether the employer will change its mind about what it wants, or when; what drawings the architect will revise, or when; or when the weather will turn nasty. Neither is it possible to predict what activities will be affected by such events, nor how they will be affected.

On the other hand, once these events have occurred, provided there is a valid time model in place, it is possible to predict their consequences and to manage those consequences effectively.

The use of computers to develop a framework to predict the future conduct of the work, which can also be used to predict the consequences of change and other intervening occurrences so they can be managed technically and objectively, have been available since the mid 1960s. However, except in the most unusual circumstances, it was only in the last few years of the 20th century that the necessary computing power and software became available to facilitate the Protocol recommendations to review, revise and update the baseline to facilitate the objective measurement of project deliverables.

Developments in hardware, software and communications services in the last decade of the 20th century have rendered it virtually impossible in the 21st century to conduct any business efficiently without the use of computers and electronic services. From the CIOB's research, it is apparent that the construction industry uses computers intensively, in design, manufacture, procurement, assembly, finance – and virtually every field other than the management of time. Further, it is apparent that time management is currently generally pursued intuitively and programmes, if used at all, are used only in paper form as a notional fixed target, against which a failure to keep pace can be identified.

Experience shows us that, whilst we are concerned here with construction, delayed completion is not unique to the construction industry. It also happens in, for example, aerospace projects, ship building, IT, oil and gas, rail

transport, petro-chemical and process plants and civil engineering projects. In fact all fields in which a unique product, the character of which is expected to change, is created over a period of time by a combination of specialised resources.

Neither is delay to completion unique to a particular culture, or jurisdiction: the same things happen in the UK as occur in the US, Hong Kong, the Middle East, Pakistan, South Africa, Australia and the forests of Peru.

The type of contract or procurement route has no effect on the incidence of delayed projects. That is so whether the project is executed under a bespoke contract, PPP, partnering, NEC3, design and build, EPC, traditional build only, or that wonderfully reassuring 'guaranteed maximum price'. All that contracts can do is set a standard of performance and allocate liability for failure; they cannot produce success.

On the other hand, experience also tells us that there are two factors common to all projects that fail to be completed on time, all over the world, in all industries and jurisdictions, under all forms of contract. They are:

- poor project scheduling and
- poor record keeping

both of which are essential to effective project control.

It is apparent that time management in the construction industry is now in about the same state as quantity surveying was at the turn of the 20th century, just over 100 years ago. There are no accepted standards to work to; no formal educational programme for those who set out to do it; no formal training for those doing it; and no accreditation or qualifications to demonstrate competence.

Project planning and project scheduling are currently carried out by those whose primary profession (if any) is another discipline. They may have come from an industry trade, be construction managers, project managers, architects, engineers (of one form or another), quantity surveyors, or just someone who understands how the software works, but without any professional education or training at all.

However, quality of performance is patchy. Some are extremely talented and experienced and some are not. Without a standard to which to work and without qualifications, it is apparent that the industry is at a loss to follow the recommendations of the Protocol and maintain a high quality of performance in time management, or to avoid the pitfalls and inevitable consequences of poor time management.

It is thus readily apparent that without some form of guidance in the standards to be achieved, little headway can be made in education and training the industry in time management.

The *Guide*

It is against this background that in September 2008 the CIOB set up a working group of varied professional interests from as far apart as Australia, America and the UK to develop a practical standard to which the industry could work, entitled *A Guide to Good Practice in the Management of Time in Complex Projects*.

From the point of view of time management, and for the purpose of identifying the type of project to which the *Guide* is aimed, 'complex projects' are identified as those which contain one or more of the following features:

- design work to be completed during construction, or
- work is to be carried out in, or to, more than one building, or
- any construction will be more than 15 metres high, or
- any accommodation will be below ground, or
- there will be multiple key dates and/or sectional completion dates to be achieved, or
- there will be multiple possessions, or access dates to be given, or
- there will be short-period possessions, or
- there will be services exceeding single voltage power, lighting, telephone, hot and cold water and heating, or
- construction will encompass civil engineering work, or
- the construction period is likely to exceed 12 months, or
- work is likely to be carried out by multiple contractors, or
- work is likely to involve more than 20 subcontracts.

Whilst it is apparent that simple projects (which tend to proceed sequentially, over a short time frame) can be managed intuitively by experienced construction managers, it is also apparent that complex projects can not. In complex projects, the consequences of express and implied changes and the effect of other intervening events on the multiplicity of activities, in a changing time frame, provide simply too many possibilities as to consequence for it to be possible to manage their effects by intuition alone. Attempts to manage time on complex projects by intuition alone, will result in failure.

That is why the *Guide* focuses on a scientific approach to the management of time on such projects. However, notwithstanding that the *Guide* focuses on the requirements of complex construction projects, without compromising its primary purpose, it is intended that it will be a reference document, capable of wider application.

Summary principles

The *Guide* is a practical treatise on the processes to be followed and standards to be achieved in effective management of time. It is not based upon any

contractual regime or procurement process and (subject to amendment of existing forms of contract to remove inconsistencies) can be used in any jurisdiction, under any form of contract, with any type of project.

Without effective time management there can be no effective cost management, nor allocation of liability for slippage and its recovery, nor accountability.

In order to achieve effective time management there must be:

- a competent appraisal of the risks that are likely to severely disrupt and delay progress;
- a design that permits the work sequences that are likely to be severely disrupted and delayed by foreseeable events to be separated into parallel rather than sequential paths;
- a time model for the project against which progress, or lack of it, can be measured; and
- a practically achievable strategy for dealing with intervening events during the design, procurement and construction process.

The word 'programme' (often used in the past to describe a printed paper document setting out a process, with dates on which various activities might be carried out) is not used. Instead, the word 'schedule' is used to describe the computerised calculated activity dates and logic. The process is referred to as 'scheduling' and the person undertaking the task the 'scheduler'. It is a process manifest in an editable computer file.

Planning and scheduling are separate disciplines. Project planning is largely an experience based art, a group process requiring contribution from all participating parties for its success. On the other hand, scheduling is the science of using mathematical calculations and logic to predict when and where work is to be carried out in an efficient and time effective sequence. Planning must precede scheduling; they can not be carried out in parallel, nor can scheduling precede planning.

Schedule preparation must be a quality assured process, against a standard which will ensure the integrity of the schedule, so that it can function as a time-model. The schedule, and any revisions and updates, are to be independently audited for integrity and technical competence.

Time management starts on the drawing board with the conceptual design. If the design is not time-effective, no procurement strategy will rescue it. Time management of complex projects necessarily encompasses the management of design, manufacture, procurement, subcontract and separate contractor work packages, information flow, quality control, safety management and the achievement of multiple key dates, sectional completion dates and multiple projects. A risk appraisal is to be carried out at inception and constantly updated throughout the life of the project. Time contingencies for the risks borne by the employer's design team and the contractor must be a part of the strategy for effective time control.

The *Guide* differentiates between the Development Schedule, prepared before a contractor is appointed, and the Working Schedule used in connection with construction. The Development Schedule can not be prepared in one process, at a single density, at the outset. It must be prepared in varying densities consistent with the information available from time to time; it must also be reviewed and revised at regular intervals, as better and more certain information becomes available. The Working Schedule must follow on from the Development Schedule and must also be prepared in varying densities consistent with the information available from time to time. It must also be reviewed and revised at regular intervals, as better and more certain information becomes available. Specialist contractors and subcontractors schedules are to be prepared in the same software as the Development and Working Schedules and integrated into them.

Progress monitoring techniques that are rooted in the comparison of data against a static baseline have limited value in competent time management in complex projects, where the work content, resources and sequence necessarily change from time to time. The work to be carried out in the short term must be scheduled according to the resources to be provided and the productivity quotients for the various work types to be carried out. The absence of a high density, short term, part of the schedule, or a short term, part calculated, other than by reference to resources, is not permitted under this *Guide*.

Because progress data will be entered only against a fully resourced schedule, the as-built record will provide data standards and productivity feed-back for future benchmarking that will improve predictability and hence reliability of short term scheduling. Progress records are to be kept on a relational database that will provide instantaneous access and retrievability of as-built data for the purpose of checking the reliability of productivity assessments in varying repetitive work cycles. Quality control and information flow should be managed via the same relational database as is used for the maintenance of progress records.

The effective management of time necessarily involves the management of the consequences of delaying events. Intervening events are to be impacted at the time of their initiation, along the lines recommended by the Protocol. The likely consequences of intervening events are to be calculated. There is no guidance on the approximation of a ‘fair and reasonable extension of time’, nor of ‘likely’ delay-related cost claims.

The time management strategy is to be set down in writing in a regularly updated method statement, which is to deal with, amongst other things, the stated strategy and assumptions adopted for:

- project planning;
- risk management;
- schedule preparation;
- schedule review and revision;
- progress update;

- record keeping;
- quality control; and
- communications.

New concepts in time management

Strategy

The most effective time management strategy starts in the design stages of a project. In the same way that (to some extent) it is possible on all projects to identify a cost effective way of achieving the same quality, projects can be designed to be time effective without compromising out-turn cost or quality. If time-effective considerations have not been entertained during the design stages, then the opportunities for effective management of change (and other impeding events) may be limited during the construction stage. In order to achieve the most effective time management strategy, the employer, design team, contractor and subcontractors are to have the opportunity to contribute to the effective planning of the part or parts of the project with which they are concerned.

Where it is foreseeable that the occurrence of a predictable risk will severely delay a sequence, a time effective planning strategy will avoid the completion of that sequence being a predecessor to the start of another sequence. The objective of a time effective planning strategy should thus be to ensure that process sequences that could be severely adversely affected by foreseeable risks are not sequential.

First, the planning strategy is to be resolved and recorded in a method statement before scheduling commences; then reviewed and revised from time to time in the light of events not previously taken into account.

Planning and scheduling

It is not good practice to plan the work while attempting to schedule it. In the same way that it is possible to start preparing working drawings and other production information whilst at the same time still designing a building, it is equally possible to schedule at the same time as project planning. However, in neither case is such an approach likely to produce a satisfactory design and consistent production information or, a satisfactory project planning solution and time effective schedule. Accordingly, the *Guide* recommends that the project planning function is performed first. The scheduling operation should then be carried out in accordance with the established strategic project plan and method statement, after the planning strategy has been established.

There is a widely held, but erroneous, belief that if the specified software provides a facility, it is acceptable to use it. However, currently available planning and scheduling software products are far from satisfactory. They contain many bells and whistles which, if not used correctly, can not only inhibit effective time control, they can actually prevent it. Accordingly,

the *Guide* sets out in detail which software controls it is acceptable to use and how they should be used. The *Guide* also sets out those commonly available software controls which should never be used, under any circumstances.

The time model

For most purposes, the time model will be a fully linked, critical path network that will react dynamically to change. In other cases (such as major earthworks and long duration activities of a similar nature) it will be a fully resourced database, identifying planned resources and productivity against a time scale. In any case, the time model will be quality assured and independently audited for integrity and competence.

The purpose of the time model is to indicate when, and in what sequence, the planned work is to be performed, so that the work and the consequences of any changes, or departures from what was intended, can be predicted and managed efficiently. Because at any one time the model can only be as accurate a prediction of the future as current knowledge will allow, it must be conceived as a model that can be improved upon as information improves or circumstances change.

Unless the work is designed in its entirety and all subcontractors and specialists are appointed before any work commences, it is unlikely to be possible to plan all the work in sufficient detail for construction purposes before commencement on site. However, if time is to be managed effectively, the activities to be carried out, the resources to be applied and the expected productivity must be identified before work on the activity commences. The density of the schedule may thus be expected to increase from that possible and necessary for feasibility purposes, as better and more certain information becomes available.

The requirements of different densities of scheduling for different purposes must be taken into consideration at the schedule design stage. The low density part of the schedule is appropriate for work that is intended to take place nine months or more after the schedule data date. Depending upon the purpose for which the schedule is intended, tasks may reasonably be no more than the proposed duration of one building type amongst others, or be trade grouped into such descriptions as ‘mechanical and electrical services’, and conveniently may be several months in duration.

The medium density part of the schedule is appropriate for work that is intended to take place between three and nine months after the schedule data date. At this stage, the work should be designed in sufficient detail to be allocated to specific contractors or subcontractors. Activities may reasonably be grouped into trade activities in locations, with durations not exceeding two months. Taking the same trade example, at this density the electrical services should be identified separately from the mechanical services and the work to both services should be identified by zone and area within a zone.

The high density part of the schedule is an essential prerequisite of work that is intended to take place in the short term, say within three months after the schedule data date. At this stage, the work should be designed in detail, the sequence and intended progress of the work clarified and the gang size resources and productivity identified. At this level, the activity duration should be related to discrete tasks, to be carried out by a single resource, identified by a limited area, and be no greater in duration than the period against which progress is reported.

Project control and the working schedule

Project control is the science of identifying, from time to time, in the light of current status and information, what the completion of a sequence, key date, sectional completion date or completion date is likely to be. Then, if that is not what is required, in the light of the information available, amending the strategy and schedule for the future conduct of the work.

Accordingly, only the quality assured and independently audited schedule is to be used for identifying, from time to time, the intended:

- periods of activity, sequence of work, and interface with any other contracts incidental to the work;
- dates and logic by which the information described in the information release schedule, information request schedule, or any other request for information, is to be supplied in relation to the activity that is dependant upon such information;
- dates and logic by which plant, materials or goods are to be supplied, or work to be carried out by the employer, or those engaged, or employed by it in relation to the activity dependent upon them;
- any time contingency required by any designer, utility, contractor, any subcontractor and/or supplier for whom the contractor is responsible in relation to any activity, sequence of activities, or key dates, or sectional completion dates and the completion date;
- identifying free float and total float that is available to be used by the contractor and/or the employer for managing the re-sequencing of the work, or redeployment of resources, from time to time;
- the degree of progress actually achieved on all activities from time to time;
- the likely and actual effect of any delay to progress on the completion of any sequence, key dates, sectional completion dates, and completion date, if any, caused by a change or other interfering event; and
- the likely effect of any proposed accelerative or recovery measures on any such sequence, key dates, sectional completion dates, and completion date.

Public consultation

The pursuit of excellence in construction management has been at the cornerstone of the CIOB's policies for the last 30 years and, in this, the CIOB recognises how important it is to facilitate dialogue and interaction between practitioners, researchers, policy makers and education and training providers to help develop, promote and implement new ideas and ways of working. To this end, the *Guide* has been published as a working draft for review and commentary.[8]

Keith Pickavance is the immediate past President of the CIOB and a Senior Vice President with Hill International; he is also author of *Delay and Disruption in Construction Contracts* (published by Informa, 2005).

8 It can be downloaded from: www.ciob.org.uk/resources/research/timemanagementdocs.

'The object of the Society
is to promote the study and understanding of
construction law amongst all those involved
in the construction industry'

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