

This item is held in Loughborough University's Institutional Repository (<https://dspace.lboro.ac.uk/>) and was harvested from the British Library's EThOS service (<http://www.ethos.bl.uk/>). It is made available under the following Creative Commons Licence conditions.



creative  
commons  
C O M M O N S D E E D

**Attribution-NonCommercial-NoDerivs 2.5**

**You are free:**

- to copy, distribute, display, and perform the work

**Under the following conditions:**

 **BY:** **Attribution.** You must attribute the work in the manner specified by the author or licensor.

 **Noncommercial.** You may not use this work for commercial purposes.

 **No Derivative Works.** You may not alter, transform, or build upon this work.

- For any reuse or distribution, you must make clear to others the license terms of this work.
- Any of these conditions can be waived if you get permission from the copyright holder.

**Your fair use and other rights are in no way affected by the above.**

This is a human-readable summary of the [Legal Code \(the full license\)](#).

[Disclaimer](#) 

For the full text of this licence, please go to:  
<http://creativecommons.org/licenses/by-nc-nd/2.5/>

**A COMPUTER-AIDED SYSTEMATIC  
APPROACH TO TIME DELAY ANALYSIS FOR  
EXTENSION OF TIME CLAIMS ON  
CONSTRUCTION PROJECTS.**

By

**Patrick John Keane**

MSc. FCIOB. ACI Arb.

A Doctoral Thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University of Technology.

October 1994

© Patrick John Keane 1994

# TABLE OF CONTENTS

---

---

<b>Table of Contents</b>	<b>i</b>
<b>Abstract</b>	<b>ii</b>
<b>Dedication</b>	<b>iv</b>
<b>Declaration</b>	<b>v</b>
<b>Acknowledgements</b>	<b>vi</b>
<b>List of Chapters</b>	<b>viii</b>
<b>List of Tables</b>	<b>xii</b>
<b>List of Figures</b>	<b>xiv</b>
<b>List of Cases</b>	<b>xvi</b>
<b>List of Appendices</b>	<b>xvii</b>
<b>List of Abbreviations</b>	<b>xviii</b>
<b>Chapters</b>	<b>1</b>
<b>Appendices</b>	<b>261</b>

---

---

## ABSTRACT

---

---

A review of existing literature and research findings indicated that whilst the incidence of time extension claims is increasing, Contractors are failing to gather, analyse and present data as evidence to such an extent that there is a high rejection rate of claims made, and a consequent significant dissatisfaction rate amongst Contractors with awards being made.

The current difficulties experienced by Contractors in managing information on site locations, combined with the low investment in, and usage of **Information Technology**, forms a major contribution to the problems arising in the preparation and presentation of **time extension** claims.

This research work identified from empirical evidence, together with construction technical, professional and academic literature, the essential criteria and features of an efficient and effective time delay analysis approach for preparing time extension claims in connection with construction projects. The evidence from these sources led to the formulation of an alternative approach based on an integrated computer-aided systematic technique which relies upon analysis of project-specific performance data.

The current practice of time delay analysis as currently executed by Contractors was formulated as a problem whose solution is implemented by the use of the disciplined capture of factual job data, systematic analysis including a computer modelled simulation exercise and logical compilation of results in report format. This allows full cross-checking and source identification of data used in the approach, and resultant computations.

The proposed approach employs an improved method of data capture, computer-



aided delay impact simulation and presentation of results. The proposed approach abbreviated to **CoSTAR** requires the use of spreadsheet, database, word processing and project planning software, all of which are currently industry standard, readily available and consequently do not require to be specifically written. The approach is designed to work on industry standard computing "PC" hardware of a specification suitable to run a full range of business software.

The proposed approach (**CoSTAR**) was tested and validated with performance data from a multi million pound, major fast track building refurbishment project and used Lotus 123 version 2.4, WordPerfect version 5.1, and Pertmaster Advance software. The approach was also subject to separate validation by a panel of experts. The testing process showed the approach to be feasible, and capable of identifying and quantifying the critical delay activities which caused the time overrun to the project's fixed contract period.

# DEDICATION

---

To Carolyn and Danielle

## DECLARATION

---

---

No portion of the research referred to in this thesis has been submitted in support of an application for another degree or qualification at this or any other university or other institution of learning.

## ACKNOWLEDGEMENTS

---

---

This research has been completed within the subject area of Construction Management in the Civil Engineering and Building Department of Loughborough University of Technology.

The undertaking and successful completion of this research was achieved with the assistance of many organisations and individuals to whom the author owes a debt of gratitude.

They include:

- Alan H Tyler my research supervisor, for the positive assistance, guidance and support he provided throughout the period of the research.
- Professor R McCaffer my research director
- James R Knowles in particular Geoffrey Brewer (Executive Director) for providing essential resource support, Ann Glacki (Head of Library and author of BLISS) for her assistance in searching for reference material, Robert Hassalder (Planning Consultant) for his contributions to the test run analysis work and Kathy Edwards for her assistance with the Thesis typing.
- The Directors and Staff of the various British construction organisations who generously gave of their knowledge and time in responding to the author's industrial survey.

- The panel of experts who kindly agreed to participate in the validation process.

Finally, I am grateful to the various academic establishments for their contribution to source reference material.



# LIST OF CHAPTERS

---

---

CHAPTER ONE	1
-------------	---

## GENERAL INTRODUCTION

1.1	Introduction to Topic of Research	1
1.2	Research Justification and Hypothesis	3
1.3	Aims and Objectives of the Research	4
1.4	Research Methodology and Work Undertaken	5
1.5	Summary of Research Achievements	6
1.6	Structure and Guide to Thesis	9

CHAPTER TWO	13
-------------	----

## LITERATURE REVIEW

2.1	Introduction	14
2.2	Review of Sources and Methodology	15
2.3	Construction Claims and Claims Management	17
2.4	The Increasing Frequency of Construction Claims	24
2.5	An Overview of the Main Problematic Issues	29
2.6	Problematic Issue No. 1 - Evidence	32
2.7	Problematic Issue No. 2 - Contractual & Legal Awareness	65
2.8	Summary and Conclusions	72

CHAPTER THREE	80
---------------	----

## INDUSTRIAL REVIEW AND SURVEY

3.1	Introduction	81
3.2	Collection of Primary Data	83
3.3	Design of Questionnaire	85
3.4	Survey Response and Presentation	95
3.5	Analysis and Interpretation of Survey Findings	99
3.6	Conclusions	116

**CHAPTER FOUR** .....124

**A REVIEW OF THE PROBLEMATIC ISSUES IN  
CONSTRUCTION CONTRACT TIME EXTENSION CLAIMS**

4.1	Introduction	125
4.2	The Problematic Issues	125
4.3	Deductions	131
4.4	Conclusion	132

**CHAPTER FIVE** .....134

**A NEW APPROACH TO COMPUTER-AIDED TIME  
EXTENSION ANALYSIS AND ASSESSMENT ON  
CONSTRUCTION PROJECTS**

5.1	Introduction	135
5.2	Criteria for Effective Assessment System	136
5.3	The Traditional Approach - Theoretical and Practical.....	137
5.4	Problem Definition	147
5.5	Proposed New <i>CoSTAR Approach</i>	149
5.6	Conclusions	174



CHAPTER SIX	177
-------------	-----

**TRIAL IMPLEMENTATION OF THE PROPOSED  
APPROACH - A COMPUTER-AIDED SYSTEM OF TIME  
ANALYSIS REVIEW (THE CoSTAR METHOD )**

6.1	Introduction	178
6.2	Procedure and Methodology	180
6.3	Trial Run of the CoSTAR Method	185
6.4	Analysis and Results of the Trial Run	205
6.5	Problematic Issues and Recommended Solutions	216
6.6	Summary and Conclusions	221

CHAPTER SEVEN	225
---------------	-----

**VALIDATION BY EXPERT EVALUATION AND REVIEW**

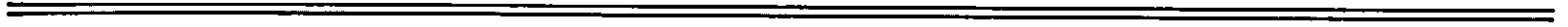
7.1	Introduction	226
7.2	External Experts	226
7.3	Validation Process	229
7.4	Conclusions	240

CHAPTER EIGHT	243
---------------	-----

**CONCLUSIONS AND RECOMMENDATIONS FOR  
FURTHER RESEARCH**

8.1	Introduction	244
8.2	Conclusions	246
8.3	Research Achievements	253
8.4	Hypothesis Review	257
8.5	Recommendations	259

8.6	Further Research	.....	259
	<b>APPENDICES</b>	.....	<b>261</b>



## LIST OF TABLES

---

---

### Chapter 2

Table 2.1	The life cycle of a claim .....	22
-----------	---------------------------------	----

### Chapter 3

Table 3.1	Regional Analysis .....	96
-----------	-------------------------	----

Table 3.2	Main geographic location of responding companies.....	96
-----------	-------------------------------------------------------	----

Table 3.3	Frequency of executing work under a JCT contract in past 2 years .....	99
-----------	---------------------------------------------------------------------------	----

Table 3.4	Analysis of usage of CPA techniques when preparing extension of time claims .....	108
-----------	--------------------------------------------------------------------------------------	-----

Table 3.5	Key areas most likely to be improved by computerisation .....	112
-----------	------------------------------------------------------------------	-----

Table 3.6	Estimate of financial output of sample.....	116
-----------	---------------------------------------------	-----

### Chapter 4

Table 4.1	Summary of analysis of Main problematic areas in the claims management process identified by the author .....	128
-----------	---------------------------------------------------------------------------------------------------------------------	-----

### Chapter 5

Table 5.1	The CoSTAR Approach .....	152
-----------	---------------------------	-----

### Chapter 6

Table 6.1	The CoSTAR Approach System Objectives.....	181
-----------	--------------------------------------------	-----

Table 6.2	Working Procedures .....	182
-----------	--------------------------	-----

Table 6.3	Computing Hardware specification for analysis work.....	183
-----------	---------------------------------------------------------	-----

Table 6.4	Software specification for analysis work.....	184
-----------	-----------------------------------------------	-----

Table 6.5	The CoSTAR Approach .....	185
Table 6.6	Construction programme versions.....	186
Table 6.7	Numeric breakdown of delays uncovered by the CoSTAR Approach at STAGE 1 .....	193
Table 6.8	Schedule of Delay Events found by CoSTAR to have caused a critical delay .....	198
Table 6.9	Data sources for Master Schedule of Delay .....	200
Table 6.10	Test results of CoSTAR system objectives trial .....	210
Table 6.11	Comparison of Critical Delays identified from alternative approaches .....	214
Table 6.12	Agreed Critical delays using each Assessment approach .....	215
 <b>Chapter 7</b>		
Table 7.1	Panel of validation experts .....	227
Table 7.2	Expert Interview Results .....	242

---

## LIST OF FIGURES

---

---

<b>Chapter 1</b>	
Figure 1.1	Guide to the thesis .....12
 <b>Chapter 3</b>	
Figure 3.1	Principal activity of company .....97
Figure 3.2	Turnover in the last financial year .....98
Figure 3.3	Frequency of need to submit a time extension claim.....101
Figure 3.4	Satisfaction rate of awards made .....102
Figure 3.5	Reasons given for claim rejection .....103
Figure 3.6	Frequency with which Contractors use computers on site .....105
Figure 3.7	Usage of critical path techniques and computerisation by Contractors when preparing construction programmes .....106
Figure 3.8	Frequency of using CPA techniques in construction programme preparation .....107
Figure 3.9	Usage of BS 5750 procedure for managing site documentation .....111
Figure 3.10	Commitment of Contractors resources dedicated to Claims Management .....115
 <b>Chapter 5</b>	
Figure 5.1	Flowchart tracking the principle stages of the CoSTAR approach .....153
Figure 5.2	Example of a CoSTAR Data Capture sheet (Form Co.01) .....155
Figure 5.3	Example page from the CoSTAR Master Scedule of Delay ....158
Figure 5.4	Example of CoSTAR Schedule of Delay Impact Sheets (Form Co.03).....162



Figure 5.5	Example of a <b>CoSTAR</b> Logic Listing Report Sheet (Form Co.05) .....	164
Figure 5.6	Exaple of a <b>CoSTAR</b> Schedule of Progress sheet (Form Co.04) .....	167
<b>Chapter 6</b>		
Figure 6.1	Illustration of analysis approach .....	188
Figure 6.2	Example of a completed <b>CoSTAR</b> Data Capture sheet.....	191
Figure 6.3	Example sheet from a <b>CoSTAR</b> Master Schedule of Delay.....	201
Figure 6.4	Illustration of the critical delays computed following the DIS exercise.....	207
<b>Chapter 7</b>		
Figure 7.1	Experts response to each system objective.....	240

## LIST OF CASES

---

---

<b>Crosby (J) &amp; Sons Ltd v Portland Urban District Council (1967)</b>	
5 BLR 121, 12 BLR 67, 20 BLR 34 .....	35,66
<b>London Borough of Merton v Stanley Hugh Leech Ltd (1985)</b>	
32 BLR 51 .....	35,66
<b>Wharf Properties Ltd v Eric Cumine Associates (1989)</b>	
45 BLR 72; CA of HK, (1991) 52 BLR 1 .....	36,66
<b>Fairweather (H) &amp; Co Ltd v London Borough of Wandsworth (1987)</b>	
39 BLR 106 .....	38
<b>Natkin &amp; Co v George A Fuller Co., (1972)</b>	
347 F.Supp.17 (W.D.Mo.1972),reconsidered,626 F.2d 324 (8th Cir. 1980) .....	45
<b>Minmar Builders Inc.,</b>	
GSBCA No. 3430,72-2 B.C.A.(CCH) ¶ 9,599 (1972) .....	45
<b>Hass &amp; Haynie Corp., GSBCA No. 5530, 84-2 B.C.A. (CCH)</b>	
¶ 17,446 (1984) .....	45
<b>Mid Glamorgan County Council v J Devonald Williams &amp; Partners</b>	
(1991) .....	66
<b>Blackford &amp; Sons (Calne) Ltd v Christchurch Corporation (1962)</b>	
1 Lloyd's Rep 349 .....	69

---

---



## LIST OF APPENDICES

---

---

Appendix A	Bibliography
Appendix B	Published articles, periodicals and papers
Appendix C	(Not used)
Appendix D	Questionnaire cover letter
Appendix E	Questionnaire
Appendix F	Database of Survey Analysis
Appendix G	Schedule of Additional Information
Appendix H	Schedule of Statistical Results
Appendix I	Experts briefing letter
Appendix J	Experts Validation Questionnaire

---

---

## LIST OF ABBREVIATIONS

---

---

ADR	Alternative Dispute Resolution
<i>CoSTAR</i>	Computer-aided System for Time Analysis Review
CPA	Critical Path Analysis
CPM	Critical Path Method
CSO	Central Statistics Office
DIS	Delay Impact Simulation
JCT	Joint Contracts Tribunal
PC	Personal Computer
PERT	Programme Evaluation and Review Technique

---

---

(Ref: ..\preamble.005)

# CHAPTER ONE

## GENERAL INTRODUCTION

---

---

- 1.1 Introduction to Topic of Research**
  - 1.2 Research Justification and Hypothesis**
  - 1.3 Aims and Objectives of the Research**
  - 1.4 Research Methodology and Work Undertaken**
  - 1.5 Summary of Research Achievements**
  - 1.6 Structure and Guide to Thesis**
- 
-

# GENERAL INTRODUCTION

---

---

## 1.1 Introduction to Topic of Research

Claims from Contractors to Employers are an integral part of the construction industry. It is calculated by the author that as much as £1.2 billion pounds could be the subject of construction claims or disputes at any one time. The process is therefore of significant interest to contracting companies operating in the British construction industry.

The practice of managing a claim, or claims management, is growing in importance, and whereas a claim might in the past have been handled by individuals in isolation on a project, there is an indication that some Contractors are investing resources in specialist individuals whether 'in house', or bought in as consultants, to undertake this work.

A major development, almost a revolution, which has occurred within the last 10 years is the introduction to the business world of inexpensive, flexible and powerful management tools in the form of micro computers and associated software. Yet despite the growing awareness of the need to apply commensurate resources to handle a claim, and the need to invest in information technology it is the authors experience that claims management is failing at an alarming rate, and central to this view is the fact that the industry has been slow to embrace and enjoy the benefits flowing from data management, processing, presentation and calculation capabilities of computerised systems.

These shortcomings are particularly prevalent in the area of time delay claims where so much turns on analysis of construction programmes and simulation of

delaying scenarios. In the British construction industry contract period overruns are common place and as a consequence a party or parties is required to meet this liability.

The review of technical, professional and academic literature revealed the extent of the problem from a theoretical perspective with a survey of the industry confirming that many of the theoretical issues actually existed and further indicating the extent of the non-use of information technology for information management and project planning.

**The survey indeed showed that whilst 83% of Contractors had made one or more time extension claims in the past 2 years, 84% of those that did were dissatisfied with the result.**

Whilst much has been written of the computation and evaluation of damages of Contractors claims, comparatively little research has been undertaken into the area of time delay analysis techniques using computer aided systems, and the presentation of same.

## **1.2 Research Justification and Hypothesis**

The author has formed the view that there exists a need for an effective approach to the analysis, assessment and presentation of time extension claims.

It is evident from the literature review and survey that the current practice and procedure adopted by Contractors is inadequate, providing further justification as well as focus for this work of research.

The motivation for the research derives from the authors experiences as a director of an international construction consultancy which specialises in claims management and dispute resolution.



This introduction thus far indicates the need for an approach to time delay analysis that provides the essential evidence, analysed, evaluated and presented to provide an effective extension of time claim assessment.

The new approach should make the fullest possible use of information technology and should remove the subjectivity as far as possible from this area of claims preparation and management.

The above described need led to the formulation of the **hypothesis** that:-

*"If a computer-aided systematic approach is used to gather, model, analyse and evaluate project specific performance data, it will provide an improved and reliable basis for assessing the critical effect(s) of interference in a Contractors progress of construction works, and will identify essential evidence pertaining to the critical delay(s)."*

### **1.3 Aims and Objectives of the Research**

In view of the importance of securing time extension awards which often lead to reimbursement of monetary entitlements, and also allowing for the problems identified in chapters 2 and 3, this research focused on determining a more effective approach to time delay analysis and extension of time assessment.

To achieve this aim it was necessary to conduct a thorough review of existing literature and research findings, and also to investigate the current practices employed by Contractors in claims management, identifying problems experienced. The review and investigations were carried out with the following objectives:-

- **Establish** the scope and frequency of time delay claims activity within the construction industry.

- **Determine** the level of effectiveness or otherwise of existing time delay analysis methods employed by Contractors.
- **Identify** from theoretical and empirical evidence the shortcomings of existing approaches to time delay analysis and time extension claims.
- **Identify** from theoretical and empirical evidence the essential features of an effective time delay analysis system for use in claims assessment preparation.
- **Devise** a solution for improving the preparation, time delay analysis and presentation of Contractors extension of time claims.
- **Contribute** to an improved understanding of time delay analysis and extension of time assessment preparation.
- **Draw** conclusions on research and development work undertaken and identify scope for future research.

#### **1.4 Research Methodology and Work Undertaken**

In view of the potential problems earlier indicated, the aims and objectives were formulated and realised commencing with investigations into current theory and practice.

The sources of information used in the literature review are defined as **secondary**, that is, they consisted of works which selected, edited, discussed and interpreted original (**primary**) sources. The main media forms consulted in connection with this activity included:

**Books, journals, magazines, newspapers, video, British Government publications, Law Reports, directories,**



**technical and management abstracts and research papers.**

The practical evidence or **primary source** was gained through a postal questionnaire survey of 345 Contractors from the British construction industry and the subsequent detailed responses received from 175 Contractors.

The industrial evidence once collected was analysed and interpreted against the background of existing knowledge gained from the literature reviewed and previous research findings.

The results and deductions found from the analysis, **chapter 4** coupled with the theoretical basis derived from the literature review **led to the formulation of an alternative approach to time delay analysis** designed to improve the effectiveness of the claims management process.

The formulated approach was then tested using "live" project specific performance data as fully reported in **chapter 6** and further validated by an expert panel in **chapter 7**.

## **1.5 Summary of Research Achievements**

The achievements of this research can be summarised as follows:

- (1) Established that claims activity is endemic in the construction industry, and that it is forecast to grow.**

**12%** of lawyers surveyed in 1993 reported a rise in construction work case load, and **9%** forecast further growth in this area.

- (2) Established that there is a high incidence of contractors claims for time extensions.**

**84%** of Contractors had recently submitted an extension of time claim.

**32%** of Contractors had submitted a claim on 1 in 2 jobs.

- (3) Established that there is a high rate of dissatisfaction amongst Contractors with time extension awards being granted.**

**83%** of Contractors were dissatisfied on one or more occasions.

**31%** of Contractors were dissatisfied on 1 out of every 2 jobs.

This was partly due to claims being rejected for the following main reasons:

- failure to establish causal link
- insufficient supporting documentation.
- claim too "global".
- written notice deficiencies.

These were in turn caused by:

- Poor information and record management resulting in deficient data suitable for analysis and presentation as evidence in support of a claim.
- Failure to use sophisticated planning techniques and computing technology to prepare and monitor project programmes, which could be analysed and presented as supporting evidence in time extension claims, which was shown by the following facts :

**49%** of Contractors **do not** use computers on site.

**36%** of Contractors **never** use "*Critical Path Analysis*" or computers to generate computer programmes.

**35%** of Contractors **never** use "*Critical Path Analysis*" to analysis time delay in preparation for claims.

- Failure to resource and implement claims management systems, to monitor and screen problems as they arise, and ensure that contractual requirements, ie. written notices, are timeously submitted and recorded.
- (4) **Identified significant short comings in the existing approaches to time delay analysis of construction project overruns, both from the theoretical and practical perspectives.**
  - (5) **Identified from theory and practice the essential criteria for an effective time delay analysis system.**
  - (6) **Identified a computer aided systematic basis for achieving effective time delay analysis and overcoming the problems stated in 3 above, and the shortcomings referred to in 4 above.**
  - (7) **Proposed an effective time delay analysis approach by formulating the time delay analysis process of contract period overruns as a computer-aided system, to achieve improved accuracy in identifying causes of critical delay and quantifying their effects.**
  - (8) **Devised an effective approach, CoSTAR, for analysing time delays on construction projects based on commonly available personal computer hardware and software.**
  - (9) **Contributed to a better understanding of time delay analysis and extension of time assessment carried out by Contractors, and the problems associated with the process.**
  - (10) **Identified areas in which further research is needed in order to enhance the above achievements and further the stated objectives of the research.**

## **1.6 Structure and Guide to Thesis**

The reporting of the research work which comprises this thesis follows the same logical flow of the methodology described at 1.4.

The material of the research was organised into eight logically related chapters as illustrated in figure 1.1 and briefly referenced below.

### **Chapter 1**

Presents a general overview of the thesis comprising of a brief introduction to and description of the subject matter of the research as well as the specific problems under investigation. It also sets out the hypothesis, aims and objectives, the manner in which the research was carried out, as well as a summary of its achievements and structure of the thesis.

### **Chapter 2**

Reports on the search and review of all relevant technical, professional and academic literature which established what is known about the subject matter including problematic issues facing claims management from a theoretical perspective.

### **Chapter 3**

Presents the findings of a survey of 175 Contractors from the British construction industry undertaken to establish the current practice of claims management activity and identify associated actual problems.



## Chapter 4

Considered the results of the literature review and contrasted these with the findings of the industrial survey. Drew deductions establishing the scope and nature of the shortcomings of the current approach both theoretical and practical.

## Chapter 5

Considered the deficiencies of the traditional approach, both the theoretical and practical aspects. From this *"time delay analysis claims"* was defined as a problem that could be solved by a computer-aided systematic approach.

Using this problem as a basis, a solution was formulated in the guise of an alternative approach, (CoSTAR), which would improve the effectiveness of the existing practice.

## Chapter 6

Presents the trial implementation of the new approach CoSTAR in a major "live" project situation employing job specific performance data for analysis. The results were analysed to assess the effectiveness of the proposed approach effectively concluding the first part of the validation process.

## Chapter 7

Presents the results of the second part of the validation process in which the author presented the new approach model to a panel of selected experts and interviewed them using a questionnaire designed to measure the approach against a set of system objectives.

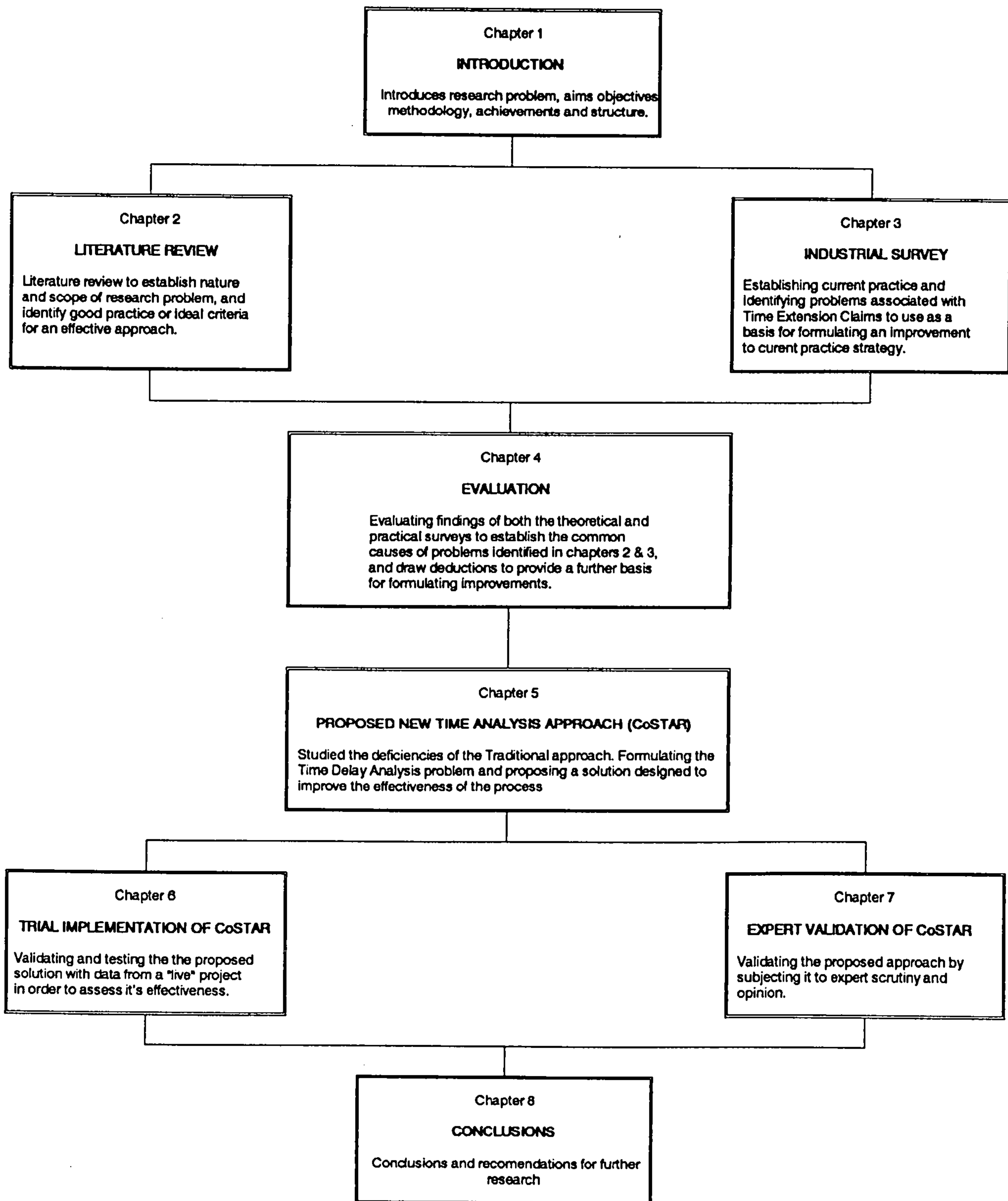


Figure 1.1 Guide to the thesis

## Chapter 8

Presents the findings of the research, conclusions drawn from the findings and the recommendations for further research on the subject matter.

---



# CHAPTER TWO

## LITERATURE REVIEW

---

---

- 2.1 Introduction**
  - 2.2 Review of Sources and Methodology**
  - 2.3 Construction Claims and Claims Management**
    - 2.3.1 Introduction
    - 2.3.2 Definition of a Claim
    - 2.3.3 Claims - Types and Categories
    - 2.3.4 Definition of Claims Management
    - 2.3.5 Claims Management
  - 2.4 The Increasing Frequency of Construction Claims**
    - 2.4.1 Reasons
  - 2.5 An Overview of the Main Problematic Issues**
  - 2.6 Problematic Issue No.1 - Evidence**
    - 2.6.1 Construction Delay Claims
    - 2.6.2 Construction Programmes and Critical Path Analysis
    - 2.6.3 Causation
    - 2.6.4 Records
    - 2.6.5 Presentation
  - 2.7 Problematic Issue No.2 - Contractual & Legal Awareness**
  - 2.8 Summary and Conclusions**
    - 2.8.1 Summary
    - 2.8.2 Conclusions
    - 2.8.3 The next stage
- 
-

# LITERATURE REVIEW

---

---

## 2.1 Introduction

This chapter sets out the theoretical basis of the main problematic issues facing construction companies in the area of **claims management** as practiced in Great Britain.

This involved a search and review of existing technical, professional and academic literature to establish what was already known about the subject matter.

Access to good well stocked library systems was essential and included both academic and private organisations. A plan of research was prepared and consideration given to the most effective method of searching, gathering, filtering and storing reference material.

Following the last mentioned activity, which will be covered later in further detail, there remained the task of converting the mass of data collected into useable information, and later into a structured Thesis.

Finally in parallel with the above searches the task of preparing a full preliminary bibliography was undertaken.

## 2.2 Review of Sources and Methodology

For the purposes of the literature review, the sources of information used were **secondary**, that is they consisted of works which selected, edited, discussed and interpreted original (**primary**) sources, the latter regarded as the 'raw' material.

The main media forms consulted in connection with this activity included:

**Books, journals, magazines, newspapers, video, British Government publications, Law reports, directories, technical and management abstracts, and research papers**

It was found that relatively little has been published specifically on the subject of **construction claims management, computer aided claims settlement and dispute resolution.**

Turning to the approach adopted in conducting the investigation, this initially comprised of a manual search using the available library systems, viewing existing ready prepared abstracts, and indexes of books and journals.

There then followed a more extensive exercise which involved the identification and listing of '**keywords**' to assist in the interrogation of the library systems, most of which are equipped for computerized searches of their databases.

The key words used in the search were:

arbitration	construction.planning
claims.analysis	disputes.construction
claims.management	disputes.management
claims.construction	disputes.computing
claims.extensions of time	disputes.resolution
claims.contractual	delays.construction

claims.loss and expense	delays.comput.analysis
claims.building	delays.claims
computing.construction	disruption.construction
computing.claims	disruption.analysis
computing.planning software	expert systems
computing.programmes	planning.problems
computing.applications	planning.software
construction claim statistics	prolongation.claims
construction industry.claims	site records
construction.delays	

Combinations of the above listing were used to search the library systems at **Loughborough, Cambridge and Reading Universities**. In addition the librarians at both the **Chartered Institute of Building**, and the private specialist consultancy practice **James R Knowles Limited**, provided comprehensive abstracts based upon using a selection of the above key words.

I visited all of the above establishments and reviewed several specialist abstracts including BLISS (Building Law Information Subscriber Service), '*Building Management*' abstracts and the Housing and Construction Statistics published quarterly by the Department of the Environment.

All of the above were used as a starting point, and the references produced yielded further references which were followed up often leading to further valuable sources of information. These included specialist research papers and projects both published and unpublished, together with accompanying bibliographies.

Prior to commencing a survey of the literature identified by reference, a preparation of as full a preliminary bibliography as possible was undertaken. This consisted in the main of published sources which were recorded prior to distilling down to the working bibliography. A full listing of this is to be found in **appendix A**.



When evaluating the 'raw' bibliography prior to reducing it to a working form two factors played a part. In the first, and bearing in mind the contemporaneous nature of the topic, the date of publication, and/or latest revision was noted. This with a view to eliminating sources which would be of little value.

The second factor was the identity and standing of the author. Although a subjective judgement, consideration was given to ensure inclusion of those individuals considered to be leading and widely respected commentators and students of the core area of research - **Construction Claims Management**.

The next process involved the evaluation, reading and notetaking of the selected literature. Statistical evidence, when available, was gathered analysed and commented upon.

The final activity in this stage of the research consisted of converting the notes and supporting data into the following narrative.

## **2.3 Construction Claims and Claims Management**

### **2.3.1 Introduction**

By way of introduction to this section it will be useful to consider the meaning of the terms **Claims** and **Claims Management** as generally applied in the construction industry.

### **2.3.2 Definition of a Claim**

A dictionary definition of the word 'claim' includes .. *"to demand as a right: to maintain or assert:- n. a demand for something supposed due ..."*<sup>1</sup>

---

<sup>1</sup> Chambers twentieth century dictionary



In the context of the construction industry this may be further defined from a financial perspective as *"the assertion of a right to payment arising under the express or implied terms of a building contract, other than under the ordinary contract provisions for payment of the value of work"*<sup>2</sup>

In addition building/construction claims are variously defined as :

*"... a request by a Contractor for financial compensation for additional work over and above the originally agreed upon contract sum, or damages supposedly resulting from events not included/envisaged in the initial contract .."*

*"...the seeking of consideration or change by one of the parties involved in the construction process"*<sup>3</sup>

*"...a demand or, if something less strong (provocative) is preferred a request or application for something to which a Contractor ... considers, believes or contends (rightly or wrongly) he is entitled but in respect of which agreement has not yet been reached" ...*<sup>4</sup>

In practice the title '*claim*' as employed in the construction industry is used to describe any application by the Contractor whether for an extension of time, payment, or otherwise, which arises other than under the ordinary contract provisions.<sup>5</sup>

It has been noted that on certain occasions the question is raised as to whether or

<sup>2</sup> Powell Smith - Building Contract Claims/p11/103

<sup>3</sup> Arditi - 'Expert systems ... (Article)/p.142/6

<sup>4</sup> Hughes - Building and Civil Engineering Claims/p5/79

<sup>5</sup> Powell Smith - Building Contract Claims/p11/103

not a particular matter constitutes a claim, and thus becomes itself the subject of a dispute.<sup>6</sup> The author subscribes to the view that it would be reasonable to accept that any matter which cannot be agreed between a Contractor and a job Architect, in the normal course of events, assuming due cognisance has been paid to the stated rules, principles and mechanisms of the contract, may be considered an item of claim.

In practice many items which during the course of a contract are the subject of disagreement, are often resolved as the preparation of the final account progresses. In this case it will only be those residual/unsettled matters to which the term claim will apply.

In summation the word claim is used most often in the construction industry to describe a Contractors applications for extension of time award(s), and loss and expense reimbursement under the various forms of building contract. In this last description a claim for loss and expense may be considered as a regulated provision for the payment of damages.<sup>7</sup>

### 2.3.3 Claims - Types and Categories

In the main there are four types of claim a main Contractor can make against an Employer which are:

- (a) **contractual** : arising out of express provisions
- (b) **common law** : arising out of breach of contract at common law
- (c) **'quantum merit'**: *"as much as he has earned..."*
- (d) **'ex gratia'** : *"out of kindness..."*, sometimes referred to as a sympathetic claim

<sup>6</sup> Hughes - The Anatomy of Quantity Surveying/p136/137

<sup>7</sup> Powell Smith - Building Contract Claims/p11/103

Of these the greatest number of Contractors claims fall under (a) **contractual** claims. These may be subdivided into categories which individually or combined from the subject matter of most claims:

- claims concerning **critical time delay**
- claims concerning **disruption of the work**
- claims concerning **payment**
- claims concerning **contract documentation**
- claims concerning **default, determination, forfeiture etc**<sup>8</sup>

Whilst the above will, in the main, form the basis of Contractors claims, categories under which employers claims/counterclaims may fall include:

- claims concerning **defects** (materials and workmanship)
- claims concerning **mismanagement** (culpable delay & inefficiency)

These are often raised as classic counter defences to a Contractors claim under the previously described heads.

#### **2.3.4 Definition of Claims management**

Brambles definition that *"the settlement of claims is simply the process of ensuring that the owner pays only a fair price for interfering with the Contractor in the execution of the work"*<sup>9</sup> is an interesting if limiting allusion to managing the claims process.

The author having studied and considered this matter, and recognising that a claim does have a **life cycle** from originating causation to settlement, see **table 2.1**, would define the practice of **claims management** as:

---

<sup>8</sup> Hughes - Building and Civil Engineering.../p5/79

<sup>9</sup> Bramble/Callahan Construction Delay Claims/p305/75

*"the process of employing and co-ordinating resources to progress a claim from identification and analysis through preparation, and presentation, to negotiation and settlement"*<sup>10</sup>

The practice of claims management is not usually confined to a particular individual in an organisation, to any contractual party or to a single profession. Claims management services are offered on a professional consultancy basis, though many of the larger construction organisations have specialist units in house to which difficult claims management problems are directed.<sup>11</sup>

---

<sup>10</sup> PJK/6

<sup>11</sup> PJK/40

<b>LIFE CYCLE OF A CLAIM</b>	
<b>Stage 1</b>	<b>Identification of Causative Events</b> Gather and research evidence Establish contractual/legal basis for claim
<b>Stage 2</b>	<b>Identification of linked effects</b> <b>Establish causal link</b> Analyse evidence and present findings Collate supporting documentation
<b>Stage 3</b>	<b>Evaluate effects and Quantify damage</b>
<b>Stage 4</b>	<b>Compile and Submit Claim</b>
<b>Stage 5</b>	<b>Negotiate settlement</b>

**Table 2.1 - The Life Cycle of a Claim as devised by the author.**

In the event of failure to negotiate a settlement, seek arbitral or legal solution.



### 2.3.5 Claims Management

In the foreword to his book "*The Management of Contractual Claims*"<sup>12</sup> Kenneth Scott describes the title of 'Claims Management' as contradictory when compared with the positive definitions of 'management' commonly espoused. That is the achievement of a desired result by the positive interaction of resources or "*making the best use of resources and getting people to work together.*"

His criticism, I consider embodies much of the current thinking that claims and their settlement should not arise, therefore by implication should not be anticipated, planned organised or controlled, in other words managed.

This perception fails to recognise that claims of the type defined, described and categorised in the previous sections have become an integral part of the construction procurement process both nationally and internationally for some considerable time, and on the basis of current evidence<sup>13</sup> it is reasonable to forecast that the situation is **unlikely** to change for some considerable time to come.

Indeed the main forms of contract allow for the unexpected to arise by including provisions for increasing the time period for the works, and/or payment of loss and expense sums, both of which have to be 'claimed' by the Contractor.

The author has formed the view, based upon his findings, that the construction process being by its nature a unique and complex activity will inevitably lead to a situation where some conflict is bound to arise, that claims are inevitable, particularly delay claims, and that claims management using a combination of claims experience and construction management practice is essential in dealing

---

<sup>12</sup> *The Management of Claims/p iii*

<sup>13</sup> *Evidence. See section 2.4*

with delay impacts as they arise.<sup>14</sup>

Callahan echoes this point stating that *"most delays occurring in the design and construction process cannot be prevented, but they can be anticipated ... the risk allocated ... and the impact of claims mitigated."*<sup>15</sup> Thus although delay causes cannot be completely eliminated, the requirement to settle claims through litigation or arbitration can be avoided through effective claims management.

To set the activity in a financial context, the author estimated that as much as **£1.2 billion pounds** could be the subject matter of construction claims at the present time, and consequently under some form of claims management. (Refer to section 3.5.5)

Whilst it is not possible to ascertain exact figures, this estimate is based on the annual construction output in Great Britain for the year 1987<sup>16</sup> (which amounted to £35 billion pounds), and the results of the industry survey (reference 3.5.5).

The fact that claims activity exists on a substantial level, and that this situation is not likely to change in the very near future leads the author to conclude that any improvements which would make **the claims preparation and settlement process** more effective, through reducing or eliminatng inherent failings and shortcomings, would provide a direct cost benefit to the construction industry.

## **2.4 The Increasing Frequency of Construction Claims**

Many authors have noted the increasing frequency with which construction claims arise, and the incidence of claims management failure demonstrated by the number that degenerate into dispute, resolvable only through the formalised and expensive

---

<sup>14</sup> Callahan - Construction Delay Claims/p289/11

<sup>15</sup> Callahan - Construction Delay Claims/p289/11

<sup>16</sup> CSO Annual Abstract, 1989 Edition/p164/10

format of arbitration or litigation proceedings.

Arditi referred to this issue where he wrote ...*"The construction process has become increasingly a dispute prone activity ... and contracting parties are resorting to arbitration and mediation more frequently"*<sup>17</sup> (Author's emphasis)

This view is echoed by Bramble and Callahan where they note that ...*"Today, delay claims are a commonplace reality. They have become an institutionalised part of the construction industry. Claims are simply part of the building process"*<sup>18</sup> (Author's emphasis)

And further by Adrian ...*"Claims are becoming commonplace on many construction projects, especially in contracts for multi-million dollar amounts"*. He underpins this view by claiming that ...*"there is considerable evidence that both the number of claims, and the dollar amount of these claims have been increasing steadily during the past decade"*<sup>19</sup>

Adrian wrote this comment in 1988, and whilst both he and Bramble/Callahan refer mainly to happenings in the USA construction market, the author drawing on his own experience holds the view that as British construction practice is similar to American in nature, the circumstances which give rise to claims are common, and it is therefore reasonable to draw parallels with Britain for the purposes of this research.

Powell-Smith and Stephenson wrote in 1989 that *"Few civil engineering contracts of any size reach completion without claims for extra time or additional payment*

---

<sup>17</sup> Arditi - *Expert systems for Claims Management.../p142, para 2/26 (Article)*

<sup>18</sup> Bramble/Callahan - *Construction Delay Claims/p291/60*

<sup>19</sup> Adrian - *Construction claims/p1/158*

*being made by the Contractor".*<sup>20</sup> Again the parallel can be drawn with the building sector of the construction industry.

Statistical data is difficult to find in this area because of the obvious reluctance of claimants and respondents to publicise such. Adrian records that the ... "*number of claims in the construction industry has been increasing steadily*" and that during the past decade... "*each year, almost without exception, has brought an increased number of claims, and claims for larger and larger sums.*"<sup>21</sup>

Such is the current state of litigious activity in the construction sector that the respected building industry weekly business magazine *Building* now publishes at regular intervals a listing of "*who is suing who*"<sup>22</sup>!

Indeed a straw poll of cases published over a twelve month period revealed that **in excess of 100 legal cases** have been brought dealing directly with the construction industry.

One of the Britain's largest accounting practices KPMG Peat Marwick further supported the above assertions when their forensic accounting team prepared a report which noted that ... "*(c)ourt cases involving the property and construction industries are rising due to recession*"...(reference CQS article,page 5,September 1991). They also included a number of statistics based on a nationwide survey carried out in May 1991 which revealed that:

- (i) **12% of litigation lawyers reported a rise in construction industry caseloads**
  
- (ii) **38 out of 100 firms interviewed had specialist litigation units for**

---

<sup>20</sup> *Powell-Smith/Stephenson Civil Engineering Claims/preface/85*

<sup>21</sup> *Adrian - Construction claims/p5,6/160*

<sup>22</sup> *Building magazine - Example/p*



**property and construction.** These were broadly spread between London and the Regions: in London 21 of the 50 firms had specialist units compared to 17 out of 50 in the Regions.

- (iii) When the litigation lawyers were asked where they saw areas for future growth **9% cited property and construction (the only industry specifically highlighted)** whilst 21% cited general commercial as a growth area.

It is little surprising that property and construction are cited in the current recessionary market. David Carter, KPMG's forensic accounting partner, pointed out that *"In the first six months of 1991 alone, 22% of the 2,136 receiverships were construction or real estate companies"*<sup>23</sup>

Bramble/Callahan provide on a broader geographical scale further opinion that claims activity is widespread when they noted that a ... *"recent survey of building owners indicated that more than one third of the owners of major new construction projects are involved in arbitration or litigation of construction contract claims."*<sup>24</sup> Author's emphasis)

#### 2.4.1 Reasons

There are several factors identified which purport to explain the likely reason for the increasing frequency of claims which Adrian sums up in the following:

- *"the complexity of the typical project has increased..."*
- *"difficulty of properly interpreting the drawings and specification"...*
- *"the economics of the construction industry in recent years*

---

<sup>23</sup> Chartered Quantity Surveyor - /p5/172/Sept 1991

<sup>24</sup> *Opinions of Building Owners on the Construction Industry (Wagner-Hons-Inglis, Inc 1985) - Bramble/Callahan/p291/60*



*is probably another reason for the increase in the number and magnitude of claims..."*

- *"new project delivery systems..."*
- *"confusion relating to the lack of a definitive complete set of contract documents..."*
- *"organisational structure that characterises some of these new delivery systems..."*
- *"involvement of insurance companies funding litigation, and also law firms recognise a fertile area for fee earning..."<sup>25</sup> (My emphasis)*
- *"increase in the cost of money ..."*
- *"materials shortages..."*
- *"new technology with regard to drawings and specifications"..."<sup>26</sup>*

An interesting point raised in the above listing is the issue of building procurement. Adrian enlarges on this item by saying that the ... *"evolution of new project delivery systems, including the construction management process has done little to reduce the number and dollar amount of claims. In fact the existence of a construction manager has on occasion complicated the liability and damage issues that accompany a claim."<sup>27</sup>*

The author emphasises the latter and suggests that the marked shift away from traditional methods of procurement with all their inbuilt, but familiar imperfections, to novel, unusual or imported systems has led to a greater likelihood of claims arising which have stretched to the limits the scope of the normal claims management role as practised up to the mid 80's.

---

<sup>25</sup> Adrian - Construction Delay Claims/p6,9,10 to 13,15,16,18 to 20/161

<sup>26</sup> Adrian - Construction Delay Claims/p23, 24/167, 158

<sup>27</sup> PJK/159

Brewer notes in a recent article that *"The imported 'management' styles of contracting have done little to place in the hands of these firms the means to price and control their risk"*

Here he is referring to the demise of the true general Contractor over the past two decades and its replacement by specialist Subcontractors who now execute over 85% of all construction work.

His final bleak note which encapsulates much of the content of this subheading says ... *"there seems to be little doubt that the confrontational environment which persists in the UK construction industry is here to stay."*<sup>28</sup>

## **2.5 An Overview of the Main Problematic Issues**

In section 2.3.3 construction claims were identified as to type and category. In practice the majority of Contractors claims, from the authors experience, are contractual in type, and concern **critical time delays and/or disruption** to the progress of their construction works, together with the financial implications of such .

After careful consideration and study of preliminary research material gathered in preparation for this thesis, the author formed the view that claims for time extension awards ( based on critical delay analysis ) and claims for reimbursement occasioned by disruption to the progress of the works are two separate areas requiring quite different approaches.

Therefore while the author's initial investigations included reviewing difficulties pertaining to **disruption** claims, he has chosen to concentrate on the problematic issues raised in connection with **critical time delay claims**.

Notwithstanding the above, it is recognised that the nature of the problematic

issues identified in connection with claims for time extensions would in fact be relevant to other claim preparation approaches including disruption.

As stated in section 2.5, the fact that construction claims activity exists, is inevitable given the current procurement procedures, and involves millions if not billions of pounds, led the author to conclude that any improvements that could be found to manage the claims process more effectively, and reduce or eliminate failings or shortcomings, would provide considerable cost benefits to the construction industry.

It is therefore the theoretical basis of these failings or shortcomings in the claims management process that this first stage of the research sought to identify and set out in this chapter under the description of problematic issues.

Following a detailed analysis of the reference material gathered during the literature review, which was broken down into individual claim related items, the following major problematic issues were identified:

**Problematic Issue No. 1 - Evidence**

This issue encompasses the difficulties which arise when Contractors are required to prepare evidence for a claim. This touches on all aspects of the process from initial gathering (including record keeping), through evaluation, analysis, assessment, and presentation. It also includes the essential matter of failure to demonstrate causation.

**Problematic Issue No. 2 - Contractual (and Legal) Awareness**

This issue encompasses the difficulties associated with Contractors failings to understand the basis of a claim, and how it must be founded. There is a tendency to mount unpopular spurious or exaggerated claims as one of the consequences. Also non-compliance with the mechanistic requirements

of a contract, for example the issue of written notices, updated programmes or forecasts of potential delay. Failure to undertake reasonable mitigation activity and trying to take advantage of a delay situation.

The issues briefly referred to above whilst not an exhaustive listing of all problematic issues existent in Contractors claims preparation, are those judged by the author to be the factors which most give rise to failings and shortcoming in the management of claims. They are explored in further detail in the following text.

## 2.6 Problematic Issue No. 1 - Evidence

This problematic issue concerns the difficulties Contractors encounter when required to prepare evidence in support of a claim. It touches on all aspects of the issue from initial recording and gathering through analysis to evaluation and presentation. A major area for concern is often the failure by Contractors to establish and demonstrate causation. A second area is the widespread criticism citing the lack of detailed substantiation.<sup>29</sup>

This section sets out in detail the difficulties and problems encountered by Contractors, particularly in the above areas.

### Background

**Identifying gathering and presenting evidence is certainly one of the most important activities connected with claims management.**

The construction industry by the nature of its activity generates a considerable quantity of documentation. This is further compounded by its constantly moving geographical nature. For example, following tender documentation there is the documentation associated with the construction phase of a project, including all manner of paperwork from design consultants drawings and control documentation, to the Contractors internal job management and cost control systems.

Thus when evidence is required to support a claim on even a moderately large scheme, say a new £10 million mixed commercial/retail development built over a 2 year period the quantity and breadth of documentation that may need to be investigated and analysed can be daunting, particularly if the claim is being prepared retrospectively at the post contract stage.

---

<sup>29</sup>

*Major - Building & C E Claims/44*



Where a building contract claim is simply a dispute as to facts then the questions "*what happened, why, when, and what was the extent of the damage?*"<sup>30</sup> would be relatively straightforward to answer.

However, in the construction process, claims often surface, where, whilst the principles may appear to be relatively established, the facts surrounding them aren't. As stated two of the most widely recognised areas giving rise to Contractors claims concern **critical time delay**<sup>31</sup> and **disruption**.

In these cases it may be necessary to obtain evidence which is then supported by expert opinion based on analysis of that evidence. For reasons already given including, complexity and quantity of documentation, and the lamentable standards of record keeping, the availability of evidence to prove say cause and critical effect of a time delay is often lacking.

Then there is the matter of what to put into, or what to look for in a claim assessment document. In the case of Contractors they must bear in mind that it is they who are making the claim, they who should understand the grounds upon which the claim is to be based, and therefore they who are best placed to select those documents eg. letters, drawings, schedules etc., on which they will rely to substantiate their case.<sup>32</sup>

Dr Chapell in his book 'Contractors Claims' holds the view that "*the greatest single reason for conflict is not normally the actual substance of the claim, but the fact that the Contractor has presented it in a confused way*".<sup>33</sup>

---

<sup>30</sup> *M P Reynolds - the Expert witness and his Evidence*

<sup>31</sup> *W T Major - Building and Civil Engineering Claims 44*

<sup>32</sup> *Hughes - The Anatomy of Quantity Surveying/137*

<sup>33</sup> *Chapell - Contractor claims/48*

This may include the submission of a claim to which entitlement is genuine but which has failed to demonstrate the basis of that entitlement, shown proper causal linkage and finally quantified correctly the purported damages. Thus the effect of this evidence is diminished if not negated altogether.

The types of evidence which may be reviewed in relation to key questions are well described and defined in such books as Reynold and King.<sup>34</sup> They include the following descriptive categorisations including :

- **direct** - actual evidence of fact
- **best** - direct or real sometimes called primary
- **real** - the object itself
- **conclusive** - ... "most convincing..." *decisive in providing a fact or source...*
- **extrinsic** - usually oral evidence in connection with written documents
- **indirect** - may be hearsay or circumstantial
- **documentary**
- **prima facie** - establishes whether or not a defendant has a case to answer
- **affidavit** - to answer statement sworn under oath
- **oral** - oral evidence given under oath
- **hearsay** - secondary source of evidence

The statute most likely to concern evidence submitted in support of a construction claim in a formal dispute settlement proceedings is the Civil Evidence Act 1968.

### 2.6.1 Construction Delay Claims

Bramble wrote in 1986 "*Construction delay claims are perhaps the most common but least understood type of dispute in the construction industry. Most claims are*

---

<sup>34</sup>

*Reynolds & King - The Expert Witness/p 67*

*submitted in a manner that will not contribute to their resolution. Many are slapped together in a simplistic and almost insulting manner. On the other hand, most claims that go to trial or arbitration are presented in such a complex way that they are not understood by the experienced arbitrator, let alone the average juror".*<sup>35</sup> (Author's emphasis)

From a study of the JCT forms of building agreement with its stress on time and the provision for liquidated and ascertained damages in the event of culpable non-completion on the part of the Contractor it is not difficult to understand why so many delay claims arise given the present adversarial and financial pressures present in the modern construction contracting industry.

On the one hand a successful time claim will shield a Contractor from the application of the pre-determined damages (LAD's) in the event of a time overrun, and on the other it will provide him with a platform upon which to base a further claim for reimbursement of costs incurred.

Bramble identifies that delay claims are common in the United States and observes that there are many pitfalls in providing evidence to support such claims.

With regard to the British construction industry Scott writes that "*many of our Arbitrations are for delay and disruption claims ...*" He then also goes on to point out the difficulties of reviewing and gathering evidence to support such claims ... "*it is a wise man indeed who could define precisely each and every delay or disruption cause and the delay and/or disruption flowing from each*".

### **Global Claims**

Indeed this latter problem is reflected in the development of case law which has recognised that because, on occasion, the utter complexity of interacting activities

---

<sup>35</sup>

*Bramble/Callahan - Construction Delay Claims/Preface*

may be too difficult to separate, a '*global*' award in the form of a '*rolled up*' time extension and resultant financial damages may be considered appropriate. A landmark case dealing with this scenario is that of "*J Crosby & Sons Ltd v Portland Urban District Council (1967)*"<sup>36</sup>

Thus having started from a point that it is incumbent on Contractors to properly and fully support their claims for delay (and disruption), it is now noted that it may not always be possible to do so. Scott<sup>37</sup> notes that as construction projects are fluid and ever changing it would be extremely rare to come across a situation where the various claims could be readily identified and itemised. What normally happens is that events complained of overlap each other, one affecting the other with events occurring in multiples.

As a consequence it may not always be possible to isolate each and every element of a claim and particularise it individually.

Thus Donaldson J gave authority to the '*global claim*' in the Crosby case, but only *as a last resort*.

The approach received further approval in the case of "*London Borough of Merton v Stanley Hugh Leach (1985)*"<sup>38</sup> when Vinelott J agreed with Donaldson's reasoning in the Crosby case and added "*The position is, I think ... if application is made for reimbursement of direct loss or expense attributable to more than one head of claim and at the time when loss and expense comes to be ascertained it is impracticable to disentangle or to disintegrate the part directly attributable to each head of claim, then, ... the Architect must ascertain the global loss directly attributable to the two causes ...*"

---

<sup>36</sup> 5 BLR 121 Donaldson

<sup>37</sup> Scott - *The Management of Contractual Claims*/p 26

<sup>38</sup> 32 BLR 51



A Court of Appeal decision from Hong Kong, in the case of "*Wharf Properties Ltd and Another v Eric Cummins Associates and others (1988)*"<sup>39</sup> was interpreted by some as a set back in the area of judicial approval of 'global' claims in that it was held that the claimant had not fully particularised his claim to show he had a genuine case.

In essence however this case indicated strongly that when preparing claims, the facts giving rise to the claim have now to be particularised, notwithstanding the difficulties this may present. On the issue of quantum the position appears to be that in certain circumstances, the global approach may be permissible.<sup>40</sup>

Thus whilst this research topic is focused on the matter of improving the claims management process with a view to successful commercial settlement without recourse to arbitration or litigation, the last comment is a clear reminder of the standard that evidence will be required to be presented in should the parties resort to arbitration or litigation to resolve their differences.

### **Delay Claim Definition**

In construction claims a delay may be defined as **the time during which some part of the construction project has been extended or not performed due to an anticipated circumstance.** Delaying incidents can originate from within the Contractor's organisation, essentially those caused by him, or from other factors interacting upon the construction project. The latter being caused by the employer, design team, Subcontractors, unions, nature etc.

Claims for time extensions, as explained earlier under most forms of building agreement in use in the Great Britain will, if granted, relieve Contractors from automatic deduction of LAD's (a predetermined fixed sum of damages) and under

---

<sup>39</sup> 45 BLR 76

<sup>40</sup> Scott - *The Management of Contractual Claims*/p 27



certain circumstances provide a right to financial compensation.

Thus many circumstances may arise during the currency of a construction project which will increase the time requirement of the performance of any given activity or indeed the entire contract period. The most common of these include:

- differing site conditions
- changes or variations in design or requirements
- inclement weather
- shortage of labour/plant or equipment
- defective plans and specifications
- employer interference

The above causes of delay not only increase the time required to perform the contract work, but also the costs for the many parties involved.<sup>41</sup>

Where circumstances have arisen causing delay Chapell writes that a ...*"considerable degree of understanding of the building process is required to arrive at a fair and reasonable estimate of the extension of time in each case"*.<sup>42</sup>

Powell reinforced this view when he wrote that ...*"Assessing a Contractor's entitlement to an extension of time is a difficult task. It is not an exact science and the length of any extension can seldom be calculated down to the last day or fraction of a day"*<sup>43</sup> (Author's emphasis)

Indeed the standard form of building contract JCT 80 under clause number 25 further emphasises this point by their use of the word *"estimate"* where requiring

---

<sup>41</sup> Bramble/Callahan Construction Delay Claims/p1

<sup>42</sup> Chappell - Contractors Claims/p89/55

<sup>43</sup> Powell - Some Building Contractor Problems/p92/142

a Contractor (who is, after all, best placed to make such a calculation) to comply with notice requirements which advise the Employer and his professional team of foreseeable or potential delays.

Powell further notes that often a contrary view is taken by Contractors (ie they tend to exaggerate rather than realistically estimate the effects of delays) in the mistaken assumption that a successful money claim depends on the determination of an extension of time award. Whilst many of the causes upon which time and money claims may be based are common, the above Contractors assumed position was extinguished by the case of "*Fairweather H & Co Ltd v London Borough of Wandsworth (1988)*".<sup>44</sup>

### Construction Programmes

A further problem is recorded by Hughes<sup>45</sup> when he wrote "*...claims are usually concerned to compare what happened with what was intended to happen. So far as construction contracts are concerned this can be by way of comparison with the original programme*". (Author's emphasis).

However he continues ... "*There seems to be some doubt on the part of architects and engineers on the one hand and Contractors on the other, as to the validity or purpose of such programmes. There is, or there is felt to be, an element of 'gamesmanship' both in preparing them and in commenting on them*" (my emphasis).

Hughes is no doubt referring here to the increasing practise of preparing an '*as built programme*' based on the original programme to assist demonstrate claims for delay. These will often be complete with logic flaws, exaggerations, etc., in some degree or form no matter how slight.

---

<sup>44</sup> 39 BLR 106; 6 CLD 09/13 (QBD)

<sup>45</sup> Hughes - Building and Civil Engineering Claims/p118/95

It is the authors view however that this evidence, for all its inbuilt imperfections, still represents, the Contractors original intent based upon the knowledge in his possession at the pre-contract stage, which when contrasted with the '*as-built programme*' provides a factual record of progress as it was achieved.

Hughes further notes in connection with contract programmes that "...*Standard forms give no real guidance as to the content or purpose of programmes. This is no doubt due to the diversity of jobs for which they are used and of the widely differing requirements needed to be shown*". This comment reflecting perhaps a weakness in the standard forms of agreement which in most cases simply call for a contract programme to be produced, set a time period for submission, and only occasionally specifying a format.

Hughes continues ... "*Where particular requirements are included in specifications there is usually a little more information, particularly as to monitoring progress, and the purposes which monitoring may be required to serve.*"

These are interesting observations when set against the premise that it is the Contractors programme which will surely comprise an essential reference document in the event that a delay analysis exercise is undertaken.

Neale on the other hand clearly holds the view that the "*contract programme forms the basis for assessing the progress of the project*"<sup>46</sup> (Author's emphasis)

It is noted in Neale's book '*Construction Planning*'<sup>47</sup> that the main objectives of planning are:

- **Analysis** - envisaging the methodology and sequencing of the work broken down to activities

---

<sup>46</sup> Neale and Neale - *Construction Planning*/p 88

<sup>47</sup> Neale and Neale - *Construction Planning*/p4

- **Anticipation** - early identification of risks to allow mitigatory action
- **Scheduling resources** - optimization of resources
- **Co-ordination and control** - Coordinate work packages, basis of predicting and controlling time and cost
- **Production of data** - Feedback for future projects

To the above the author would add for the purposes of claims management:

- **Recording** - tracking and plotting actual progress, also recording of snapshot analysis at times of major delay/disruption.

So perhaps we can already identify one of the root factors which can give rise to problems in this major claim area and that is the preparation, format and logical basis of the **originally prepared Contractors construction programme**.

It was noted by Knowles and Carrick at a seminar on construction claims in March 1991<sup>48</sup> that ...*"time plays an important part in any project and so not surprisingly claims for extension of time, or for recovery of costs on a time related basis are probably the most commonly encountered"* (my emphasis). Again this reinforces previous views referred to.

They continued ...*"it is probably the case that if both the Contractor and the Employer's agents made more and better use of planning techniques then a considerable volume of claims of a time related nature simply would not manifest themselves"*.

---

<sup>48</sup>

*Knowles/Carrick - Seminar Notes - Construction Claims ... Using Computers/p2 & 7/168*



This is an interesting view and one that will be returned to, but finally they make a strong point with particular relevance to evidence gathering that *"It is manifestly incorrect to base a claim on a programme which could not be adhered to, or indeed was not adhered to"*.

Bramble<sup>49</sup> expands this point when he states that the *"performance time requirements in construction contracts are often unrealistically optimistic..."* This may of course not be the Contractors fault as he notes *..."contract performance time may be determined by the Designer ... without a realistic evaluation from a construction standpoint..."* Indeed he continues with a comment reflecting so much the flavour of the property development industry of the 1980s that *..."sometimes owners needs...determine an unrealistic construction period"*.<sup>50</sup>

Indeed Phipps supports this admittedly generalistic view of the *"grand schemes of people called developers"*, the latter whom he comments *"all too often ... have little more than an idea backed by an ability to borrow"*.

Bramble however proposes that this situation may be relieved by suggesting that where a Contractor submits a proposed timescale/programme, the employer and his design team should consult a professional project planner to analyse and provide comment as to the sufficiency of the proposed construction contract performance period.

**At this point it might be useful to note the following interim conclusion - that as time slippage/overrun is the most common basis of most construction claims then the application of time management techniques are vital both at pre-contract and contract stages.**

## **2.6.2 Construction Programmes and Critical Path Analysis**

---

<sup>49</sup> Bramble - *Construction Delay Claims/p 299/62*

<sup>50</sup> Phipps Michael - *Article Building Magazine 26 June 1992/p30*



It was noted in a previous paragraph that the root cause of many delay claims is the preparation format and logical basis of the original construction programme and Hughes comments that the standard forms of agreement do not give guidance as to the format or purpose of the programme.

Bramble<sup>51</sup> also notes this failing ...*"Although most standard construction contracts provide for the Contractor to submit a construction schedule, most standard form construction contracts do not provide for a detailed computer-assisted construction schedule such as a critical path method (CPM) schedule"*.

He then goes on to advance the argument in favour of using a more sophisticated form of programme *"A critical path method schedule provides for a much greater degree of detail than the traditional bar chart and hence requires the Contractor to consider its proposed methods and procedures in much greater detail"*.

His main point being that ...*"The greater detail in the construction schedule, the better reference from which changes and variations which delay the project can be measured."*

This is a fundamental principle in both claims and construction management and will be returned to in the later section of this research.

However returning to Bramble to conclude this point; he notes that whilst critical path method scheduling has been applied in the construction industry for over 25 years, many Contractors have either not used it, or perhaps more importantly not used it effectively. He writes *"There are many Contractors who employ CPM scheduling for mere superficial compliance with specification"*.

The author observes from his own experience that despite the availability of cheaper and more robust computing power, many British Contractors professing

---

<sup>51</sup>

*Bramble/Callahan - Construction Delay Claims/p299/62*

to use CPM (CPA) techniques do not fully understand what they are doing. For example they will make far reaching changes in reactive resequencing of works, occasionally adding a considerable additional quantity of activities to the programme, and in doing so risk, or achieve departure, from the original logic based on the method statement and knowledge in the mind of the Contractor at tender stage.

On occasion they will issue optimistic '*internal target programmes*' which inevitably get leaked to the Employer rather than submit the contractually required delay and disruption notifications followed by a '*freshly*' resequenced programme.

It is also observed, from the authors own experience, that many Contractors have little idea how to employ CPM/CPA techniques to present a time extension claim.

Chapell<sup>52</sup> added further weight to the problem of properly assessing delay claims when he wrote "*Contractors often complain that architects do not properly understand what can be called the 'stone-in-the-pool' effect. A delay in one activity can spread ripples of delay throughout other activities which may not appear to be related*". He then goes on to say that ... "*a network can show the effect to some extent ... It is a familiar problem to Contractors, but it appears to cause architects some trouble*".

A point which it is useful to note at this stage relates to the degree of evidence which may be available in these situations, and its validity in actually proving the effects of delay in terms of an extended construction period.

In other words whilst the CPM/CPA techniques exist, and can now be allied to modern cheap computing resources, can this be held as the answer to resolving the many delay claims which arise?

Knowles/Carrick<sup>53</sup> write *"the advent of modern, powerful, personal computers and comparatively sophisticated software available on today's market, whilst not providing a total solution to everyone's time related problems, provides a first class medium for the consideration of related problems"*.

A further problem in connection, noted by Hughes<sup>54</sup> where *"Contractors often give notice of delay aggregating considerably more than the period by which it is apparent that the time for completion will be exceeded"*.

This is a common problem and is due in some measure to overestimation on behalf of the Contractor. It will also often be due to the fact that some delays overlap (concurrently) and indeed some do not lie on the critical path.

**Both these problems can to a degree be eradicated by the use of computer assisted critical path analysis techniques.**

### Computer Evidence

The advent and usage of computer assisted claims has met with mixed reaction when received, ranging from an 'open minded' reception to deep scepticism and suspicion.

The main evidence likely to be presented on computer output which is not simply a factual record easily capable of being checked, (such as an instruction register), is the results of network analysis in attempting to demonstrate and support claims for time and disruption.

Knowles/Carrick describe this type of evidence as a *"first class medium"*, and for many years American courts have consistently held for example bar charts to be

---

<sup>53</sup> Knowles/Carrick 'Seminar Notes - Construction Claims .../p2/168

<sup>54</sup> Hughes - Building and Civil Engineering Claims/p116/93/94

less effective than network diagrams as a scheduling technique to define delays.<sup>55</sup> Indeed there are several American cases (*Natkin & Co, Minmar Builders Inc, Hass & Haynie Corp*)<sup>56</sup> which highlight the courts views on the weaknesses of bar charts in their lack of logical networking and interrelationships of activities.

However in Britain the use of CPM/CPA in programming has been slow and generally confined to the construction industry's largest companies. The use of networking to demonstrate delay claims has been even slower in coming, and in the author's view still requires further research and development work before it becomes more widely accepted by arbitrators and judges as reliable and acceptable evidence in critical time delay claims.

### Construction Programme - Daywork Effect

Much is made by employers consultants of the requirement of Contractors to constantly update programmes, progress, schedule and notify of changes. However this is not always possible as Major<sup>57</sup> notes "*By its nature (daywork) is work which cannot be planned and programmed in advance ... Contractor is required to deal with on a day to day basis..*"

He then goes on to identify typical problems which can arise:

- "(a) *Work may be required at short notice leading to interference with other planned work*
  
- (b) *The fact work cannot be measured and valued means it is not likely to be possible to estimate in advance the labour and plant requirements.*

---

<sup>55</sup> *Bramble - Construction Delay Claims/p149*

<sup>56</sup> *See List of Cases*

<sup>57</sup> *Major - Building and Civil Engineering Claims/p68, 69/42*



- (c) *It will always absorb labour and plant resources that could be applied to other work. It is not practicable to increase those resources to meet unknown future demand".*

The basic point he makes then is that *"the overall effect of any but the smallest amount of daywork will be to disrupt smooth planning and progress of the works and to delay that part of the work affected"*.

Thus consideration should be given in the *"greatest possible detail"* when considering the overall effect both on contract performance and contract completion as *"there will always be a general effect due to diversion of labour and plant from the programmed work"*.

### Concurrent Delays

The previous paragraphs touched upon a further area of difficulty in gathering and reviewing evidence of delay, namely the matter of identifying concurrency of delays and eliminating such duplication.

Hughes goes into much detail in his book dealing with this problematic area expounding an analytical approach with diagrammatic presentations.

One particular aspect of this problem writes Hughes<sup>58</sup> is *"how to deal with overlapping delays, and what the effect has been of those delays for which the employer is responsible against those for which he is not"*.

He then makes the all important point that *"Extension of time is concerned with delays which occur on the critical path, or a path which has become critical"*.

This contention is very clear, and may be related to clause 25 of the JCT contract

---

58

*Hughes - Building and Civil Engineering Claims/p14/81*



which stipulates that the Architect will only make extension of time awards for those delays which have delayed the contract period as a whole.

Thus it may be appropriate to sum up problems associated with gathering and reviewing evidence in connection with delay claims. Establishing that a fixed contract period existed, that it was exceeded and the amount by which it was exceeded, are all relatively easy to establish as facts. Even the listing and identification of causes of delay which actually occurred may be established with factual evidence. The difficulties arise mainly in connecting or linking the alleged/proved causes of delay with the actual critical effect of delay whilst simultaneously allowing for the effect of float built into the contract programme, and also Contractors inefficiencies.

It is obviously one thing to be able to identify the cause and effect of a delay which was the subject of a total work stoppage, for example a labour strike, and quite another when a complex interaction of delaying causes resulted in the works 'slowing down'.

Finally on this area Bramble<sup>59</sup> writes *"The requirement of the submission and maintenance of a CPM schedule is not a panacea. The CPM schedule is only as good as the commitment, thought, and utilization of the technique and underlying information"*.

This in the authors view is absolutely correct. It is clear that construction planning remains a skilled but fairly subjective exercise and thus a potentially weak source of expert evidence.

Bramble further makes the point that schedulers often make mistakes, the most common of which is failure to show the Contractors original intent for the project.

---

<sup>59</sup>

*Bramble/Callahan - Construction Delay Claims/p300/64*

One of the most difficult areas in using CPM in claims management for developing a case demonstrating delays is relying on the logical linking and sequence of activities. As Bramble states *"The use of restraints at the proper locations can become very complex ..."* (that is getting all the linkages correct). He continues *..."Failure to provide these restraints produces an inaccurate picture of the logical progress of the project"*.

The result being flawed evidence which may have little credible basis.

Bramble<sup>60</sup> also alludes to the failure, often of witnesses before a hearing, expert and lay, to properly review and understand how the critical path ran through a CPM schedule.

He also criticises Contractors who are tempted to develop a CPM analysis around a design change by the employer whilst failing to consider more fully possible other causes of delay (including those of the Contractors making).

### 2.6.3 Causation

Construction claim analysis is often a study in causality, that is the relationship of cause and effect.

In the previous section it was shown that an essential ingredient required to be present in a construction claim is a clear demonstration of the link between cause and effect. The establishment of which causes considerable problems, but the lack of which almost certainly leads to failure of the claim.

As Powell-Smith<sup>61</sup> notes..."A Contractor's failure to show that (for example) loss or expense is directly caused by the specified event is a ground on which a claim

---

<sup>60</sup> Bramble - p301/65

<sup>61</sup> Bramble - Construction Delay Claims (2nd Edn) para 5.17 p154

may be rejected".

The basis of this requirement is founded in law, and is expanded further in this section.

*"Causation simply asks the question whether or not the defendant's liability (the failure to perform the duty owed to the plaintiff) has adversely impacted or injured the plaintiff".<sup>62</sup>* The analysis of causation may be described as similar to the chain reaction analogy used to correct the failure to perform a duty and a plaintiff's injury in a litigious test action.

However, as Bramble continues ...*"it is especially important to establish ... (the)...link in lost productivity claims because of the multitude of factors that may affect labour productivity, only some of which may justify recovery"*. This comment can be applied equally to time extension claims or indeed any others where the circumstances warrant and require it.

Although as previously stated Bramble and Callahan deal mainly with the USA construction industry, it is the authors view that many of the basic principles upon which their views are based are equally applicable to the British construction industry.

Therefore the gathering and managing of witness of fact statements (if thought appropriate at an initial claims presentation stage) together with supporting documentation is essential in establishing the **cause and effect relationship** in a construction claim.

In previous sections it is noted that the majority of construction claims are concerned with critical time delays and/or disruption to progress of construction works.

---

<sup>62</sup>

A Contractor's entitlement under the JCT forms is to recover the **actual** loss and/or expense (damages) which is **directly** caused by the event or events giving rise to the claim.

As Powell-Smith<sup>63</sup> notes ... *"it is not sufficient for the Contractor to establish that the delay or disruption would not have occurred had it not been for the event."*

Thus the ... *"loss or expense must be caused directly by the event, eg late information ..."* and of course be **shown** to be so in the claim.

The difficulty of providing the required evidential linkage is an oft noted and discussed problem in claims management, particularly in the matter of identifying disruption costs.

Obviously the party most able initially to identify and recognise *"that a delay problem exists, and whether the cause is its own responsibility"*<sup>64</sup> is the Contractor. The Contractor in this position should deal with the cause or impact so as to mitigate the effect by the use of 'best endeavours', whilst in parallel recording as fully as possible the relevant details and complying with his contractual responsibilities as to notifications etc. All too often this does not occur and problems arise.

Due to the complex nature of construction activity the analysis and ascertainment of delay and disruption claims causes problems as noted by Goodchild<sup>65</sup> ... *"it is the wise man indeed who could define precisely each and every delay or disruption cause and the delay and/or disruption flowing from each"*.

---

<sup>63</sup> Powell-Smith - *Some Building Contract Problems*/p137/144

<sup>64</sup> Bramble - *Construction Delay Claims*/p290/13

<sup>65</sup> Goodchild - *Arbitration, a Practical Guide ...*/p 1173



An interesting point raised by Hughes<sup>66</sup> is that in addition to the difficulty of isolating cause and effect there will be the matter of apportioning liability where it is not really clear ... *"it will not always be possible to be dogmatic in deciding on claims, as for example some matters, the fault of the architect ... will have a contributory factor from the main Contractor, and vice versa. Thus in such cases allocation of blame will have to be decided upon on weight of evidence and/or judgement..."*

This point is further underlined by Capper<sup>67</sup> where he finds that *"Design expectations often now involve leading edge technology which can be unrealistic in relation to traditional construction methods"*.

And yet *"Traditional building procurement involves a disparate team, with employer design and supervision, nominated subcontracting, and third party monitoring of building control and quality"*.

Here there is ample opportunity for 'greyness' to creep in on the question of apportioning liability for the cause of a matter arising. As Capper reasonably notes *"This is a fertile seed-bed for legal claims, both during construction and after, because multiple lines of involvement obscure the location of responsibility and"*, he continues in a commercial vein ... *"provide a wider choice of solvent 'suable' defendants"*.

Indeed the preceding points raised again reinforce one of the tenets upon which my research project is based, namely that the size and nature of the industry with its multiple competing professions and its historical adversative approach to contracting will, on the current balance of risks, lead to the continued incidence of claims arising which will have to be managed.

---

<sup>66</sup> Hughes *The Anatomy of Quantity Surveying/p156/139*

<sup>67</sup> Capper *Construction Disputes - Liab and the .../p1/118*



It was found that whilst on occasion Contractors may have attempted to particularise the purported causes of delay/disruption circumstances, they singularly fail within the claim document to link these matters to the effects in terms of quantification, whether on a time extension award basis or reimbursements of costs.

This point is again underscored by Powell-Smith when he states "*many a potentially valid claim founders because of ...the Contractors inability to (a) establish the direct link between cause and effect with regard to delays ...*" (my emphasis)

Knowles<sup>68</sup> points out the particular difficulties which face Subcontractors on a typical contract whereby a main Contractor when faced with claims from Subcontractors, the interrelationship of whom have exacerbated 'knock-on' effects, will "*not usually devise a formula for isolating blame or introduce sophisticated planning methods with high tech equipment to provide the solution*"... but will instead be inclined to ... "*take the easy route and blame everybody but themselves*".

As if this point needed any further reinforcement Hosie<sup>69</sup> perhaps sums up this issue with his view that "*If the Contractor is unable to establish the essential link between cause and effect, he may well find that whilst the works did indeed take longer than planned to complete, and cost more than was projected, the claims for extensions of time and reimbursement of cost will be very difficult to prove*".

It is perhaps worth noting in this section the oft mistaken belief by some Contractors that there is a direct contractual link between extension of time awards and loss and expense claims. This view is erroneous as shown in the Fairweather<sup>70</sup> case ... "*there is no connection between clause 26 and the extension*

---

<sup>68</sup> Knowles - *The Pen is mightier than ...* /177

<sup>69</sup> Hosie - *Global claims*

<sup>70</sup> Fairweather H & Co Ltd -v- London Borough of Wandsworth (1987) 39 BLR/106

*of time provision, clause 25..."*

Whilst it has been referred to in previous text it would be useful to recap the typical response to or questions that will be asked of those Contractors who attempt to submit detailed cause and effect claims.

These are neatly summed by by Hughes<sup>71</sup> when he comments on the difficult matter of assessing with any precision delay and disruption... *"there are two major difficulties to be faced ...*

*... First, there is always the possibility that the Contractors tender was low and so any comparison would overcompensate*

*... Secondly, there is always the possibility of inefficiency in operation"*

This second difficulty is one which occurs even with the best and/or largest Contractors. However Hughes also notes that ... *"of course the very problem being investigated is one of inefficiency imposed upon the Contractor.*

So **mis-management** by the Contractor is one of the main responses to a claim by a Contractor that he has been disrupted in the course of the works resulting in additional costs, and whilst it is perhaps equally difficult to 'prove' mis-management, the onus will usually be on the Contractor to 'prove' that any delay/disruption was caused by circumstances outside his area of liability.

The demonstration of linkage between cause and effect will fall usually to the gathering and presentation of evidence. It may take many forms, perhaps most convincing being the use of charts demonstrating for example 'S' curves of cost/value recovery comparisons set against the contract timescale, cash flow curves, histograms of labour and plant, and obviously depending on the nature of the contract works, charts depicting the progress of a number of critical

---

<sup>71</sup>

*Hughes - B&CE Claims /p122/123/96*

activities/resources set against the timing and effect of disruptive circumstances arising.<sup>72</sup>

In addition to the above, the breakthrough in cheaper, more reliable and equally sophisticated computing power has brought the superior calculating and presentation facilities of computer assisted network analysis to within the grasp of even the smallest Contractor.

So whilst problems may continue are going to be experienced in the presentation of critical delay claims either traditionally or with the aid of computer assisted and generated analysis documentation and charts, and whilst the use of CPM is not a panacea, subject as it is to scrutiny in terms of its "*logical correctness*", it is still a major leap forward in providing an improved method of demonstrating as clearly as possible a direct link between cause and critical effect in construction delay claims.

**In summary of this section, problem arise where Contractors are unable or fail to particularise each and every causative event which has given rise by their effect to a critical time delay.**

Global claims were referred to in a previous section, and in general will not bring relief to a Contractor who fails properly to particularise a delay claim to the level of detail that is possible. particularly under the formal proceedings of arbitration or litigation.

#### **2.6.4 Records**

There is hardly a text book nor seminar on the subject of claims that ignores the most vital topic of record keeping and its impact on the likely success or failure of a claim.

---

<sup>72</sup>

Yet as Powell-Smith<sup>73</sup> writes *"Probably the most usual reason why many potentially valid claims are abandoned is the claimant's failure to maintain adequate records, either of events, or of cost, or of both"*.

Indeed he reinforces this view ... *"Without proper relevant and contemporaneous records the evidence needed to establish the claim is not available and the claim is doomed"*.

On the same subject Scott<sup>74</sup> records that *"Perhaps the biggest failing on the part of Contractors when dealing with claims is the lack of sufficient recorded data on the effects of delaying and disrupting events"* (Author's emphasis).

A further leading industry commentator Trickey<sup>75</sup> holds the view that ... *"The absence of contemporary evidence is probably the single most important reason for the settlement of claims degenerating into an expensive game of poker"*.

Although this is a somewhat colourful opinion, it is nevertheless the author's experience that claims pursued, whilst not properly founded on relevant evidence, indeed do attract a high degree of gambling element as costs in connection with the unresolved settlement continue to rise, and in all likelihood, become attached to the original claim.

Trickey goes on to note that whilst the JCT 1963 edition was woefully inadequate in the area of records the later 1980 edition<sup>76</sup> was a significant improvement in making it a contractual requirement that the Contractor would, in addition to submitting timeous notifications of delays (in themselves essential records), be

---

<sup>73</sup> Powell-Smith - *Civil Engineering Claims*/p140/88

<sup>74</sup> Scott - *The Management of Contractual Claims*/p20/32

<sup>75</sup> Trickey G - *The Presentation and ...*/p302/99

<sup>76</sup> RIBA - *The Joint Contracts Tribunal Standard Form ...*1980



required to keep and maintain records in relation to claims. (Clauses 25.2, 26.1.2 and 26.1.3)

Thus failure to do so not only reduces his chance considerably of pursuing successfully a claimed entitlement otherwise reimbursable, but also of placing him in breach of contract. This may be of particular relevance to Subcontractors in the contractual chain who may be being relied upon by other parties to produce evidence of delay and disruption or other matters giving rise to additional costs.

A further comment underlining this problematic area of claims management, if it is needed, is from Bramble<sup>77</sup> who writes ... *"two factors tend to result in needless litigation of claims"*

- (1) the failure to deal with variations and disruptions as they arise; and ...
- (2) **the resulting absence of contemporary evidence** when the claim finally becomes so serious that neither side can ignore it

Thus Powell-Smith may be used to sum up the problem when he states that *"many a potentially valid claim founders because of lack of proper substantiating evidence (from a Contractor)..."*<sup>78</sup> and is ... *"deficient in the matter of supporting evidence"*<sup>79</sup>

He goes on to state that *"If the Contractor is to provide substantiating evidence he must have adequate records"* and equally importantly the point that *"It is clear that a heavy burden is placed upon the Contractor, but unless detail of this kind is provided no proper ascertainment can be made"*.

From the author's experience whilst it is generally considered highly prudent to

---

<sup>77</sup> Bramble - Construction Delay Claims/p303/66

<sup>78</sup> Powell Smith Building Contract Claims/p319/105

<sup>79</sup> Powell Smith Building Contract Claims/p322/106



... "accumulate reasonable evidence during progress (the currency of the contract) against the contingency that it might be required"<sup>80</sup> this does not happen.

What does appear to happen based on the author's own experience is often an exchange of vague, poorly thought out and drafted correspondence, vague unsubstantiated statements made in writing or verbally with very little effort made to record properly the salient details of a problem which has arisen in a clear and logical format. Indeed one example the author has encountered was a confused, generalistic and emotive 10 page letter accompanied by an inch thick pile of irrelevant computer printout in an attempt to resolve a problem.<sup>81</sup>

In fairness as Scott<sup>82</sup> notes *"Most Contractors set out with the best of intentions to maintain good records but by some ironical twist they appear to put the maintaining of records on the back burner precisely at the time when they are most needed, ie. the time they are being delayed and disrupted"*

Indeed it is often a natural tendency with Contractors, large and small, *"to expend ... (their) energies in overcoming the particular delay or disrupting event"*. Thus whilst this is all well and good for the progress of the contract it is a potential nightmare for the individual(s) responsible for recovery of money particularly additional sums brought about by disruption etc.

In the same vein Knowles<sup>83</sup> specifically highlights the problems of Subcontractors who he says *"often plead that time and resources are needed if they are to heed the oft given advice to keep adequate records. This all costs money which they say they cannot afford"* Thus they are denying themselves a degree of insurance in

---

<sup>80</sup> *Turner Building Contracts /p268/110*

<sup>81</sup> *Source confidential*

<sup>82</sup> *Scott - The Management of Contractual Claims/p20*

<sup>83</sup> *Knowles - Article: The Pen is Mightier than the Shovel c Feb/Mar 92*

respect of potential claims that may be levied on them through the contractual chain.

Perhaps it is the nature and scope of the potential back up evidence that is discouraging Contractors to adopt a disciplined approach to all record keeping.

The source, format and content of job records can take many forms and including:

- Tender and Contact documentation
- Enquiry documentation
- Tender build ups
- Cost records and information
- Contact correspondence
- Drawings, schedules and registers
- Minutes of meetings
- Labour, material and plant returns
- Variation instructions/Change orders/CVI's
- Site diaries, photographs etc

The above is not intended as an exhaustive listing but to indicate the potential enormity of information and record management that is required even on relatively small contracts.

Some specific problems that can occur include

- (i) **Correspondence** - a "*battle of letters*"<sup>84</sup> developing as site problems arise, correspondence increases, each side making accusation and counter accusation etc. as Scott notes this ... "*leads to a polarisation of views with the parties taking up positions from which they find it difficult to move.*"

In addition there is the major problem, often found, of Contractor's correspondence files which are incomplete or out of sequence. Also where a consecutive referencing and numbering system has not been used.

- (ii) **Tender documentation** - Because of the closely competitive nature of the construction industry most Contractors guard their tender build ups jealously and are extremely reluctant to make them available for the purpose of ascertaining loss and/or expense.

This despite the limited protection provided by clause 5.7 of JCT80 and by clause 1.8 of IFC84.

- (iii) **Registers and schedules of information** - Despite the remarkable advances in cheaper computerization many contracts still fail to take advantage or recognise the need to manage information flow by for example creating computerized schedules or registers to track drawing issues and changes. Also recording instruction changes received and CVI's issued.

- (iv) **Minutes of site meetings** - have gained something of a notoriety with regard to the mutual agreement, or rather disagreement, of what was recorded in them, and often becoming in themselves the subject of correspondence as one party dissents or raises objections to statements alleged to have been made.

They are however a **key source** of record and allow the Contractor an ideal opportunity to directly notify the employer of any matters of a potential claims nature and equally the employer (and/or his consultants) an opportunity to take mitigating action accordingly.

- (v) **Site diaries** - The usual problem encountered here is a poorly completed diary, or indeed the non existence of one. A properly completed site diary by the '*person-in-charge*' provides an ideal record of events which took

place.

- (vi) **Photographs** - Again whilst detailed and regular photographs showing not only progress of the works, but highlighting those elements of the works which were delayed and disrupted, are of good evidential value, they **must be authenticated**.

Too often photographs are taken ad hoc, undated, and left to gather dust in a box until the end of the project.

- (vii) **Labour, plant, and material returns** - Two main points arise here
- **Labour returns** if they are to be of any value should be completed daily, or at the very least weekly, and if possible a brief coded description of either activities being undertaken and/or more importantly in the context of the claims scenario, details of standing time and reasons.
  - **Plant** - As most Contractors now employ the use of either hired plant, in house plant or a mixture of both, detailed records should be kept of each.

The activity therefore of record keeping and management appears to be one fraught with difficulty.

As Scott noted Contractors often set out with *"the best of intentions to maintain good records"* and Powell Smith further elaborates *"Contractors ... (should)...readily appreciate that it is in their interests to keep detailed records of all cost factors related to individual contracts, and be prepared to abstract those for the purpose of substantiating any contractual claim."*<sup>85</sup>



Bramble makes the valid point that *"Construction is, at best a difficult process, and an accurate record of how a project was actually completed is, with few exceptions, nearly impossible"*.<sup>86</sup>

Bramble further expands this view *"The potential that exists for exaggerating the picture of the events surrounding a claim is thus almost limitless. Reconstruction of events surrounding a claim in the absence of contemporary documentation requires a reliance on memory, a most unsatisfactory way to determine the proper value of a claim."*<sup>87</sup>

It should not be forgotten either that the employers consultant team will of course be maintaining records of their own which may include architect/engineers/quantity surveyor file notes and reports, clerk of works reports, Contractors time sheets and daywork records.

However as Powell-Smith notes problems can arise here for example ... *"Where, as is often the case, the engineer maintains a separate set of records, a problem will arise if and to the extent that the engineers records and those of the Contractor are not identical"*.

This notion will be returned to later in the research project, but it is clearly the implications are that where gaps or differences appear between the Contractors records (matters which should be of fact after all!) and those of the employers team then disagreement can all too easily turn to dispute.

Even if an architect (or engineer) is prepared to proceed with a review of say an extension of time claim, which may take the form of some critical path analysis, such analysis will still be largely dependent on the quality of the information contained in the Contractors claim.

---

<sup>86</sup> *Bramble - Construction Delay Claims/p304/70*

<sup>87</sup> *Trickey - The Press/p312*



Thus, as Hosie<sup>88</sup> notes ...*"such procedures will require a system of documentation and records which is considerably more sophisticated than that presently in wide use on a number of construction projects"*.

The author thus draws the conclusion that it is the lack of pro-active information management of the above documentation and records that causes so many problems when gathering supporting evidence for a claim.

And whilst many of the industries leading players are increasingly turning to the use of on-site computer assisted record keeping (such as Bovis, Trafalgar House, Wimpey, Higgs and Hill<sup>89</sup>) many more continue to employ archaic and inefficient systems unable to cope with the considerable demands of tracking the flow of information, processing of data and distribution.

However it is recognised that because of financial restrictions a line must be drawn to some extent between the ideal and reality, and although it would obviously be possible to keep records in minutiae on all aspects of a contract there must be struck an optimum economic balance.

For example on time management alone Neal<sup>90</sup> notes that *"Progress monitoring is expensive. It requires a large proportion of the planners time and also of those who will supply the information. Thus some effective level of detail has to be established, but, more importantly, the items that are to be monitored must be selected carefully. It is not economic to monitor everything..."* Thus a Contractor's site manager together with the cost surveyor/engineer and the individual responsible for claims management must select those items of monitoring that will give them sufficient information to **manage and control, recover money, and track and warn of potential claims risks**, respectively

---

<sup>88</sup> Hosie - Article - Global claims/p18

<sup>89</sup> Ridout - Article - Site screens (Building 26.6.92/p 46-47)

<sup>90</sup> Neale - Construction Planning/p95/125

## 2.6.5 Presentation

An observation by Chappell was noted earlier where he cites that ... *"the greatest single reason for conflict is not normally the actual substance of the claim, but the fact that the Contractor has presented it in a confused way"*<sup>91</sup>

Proper presentation of a claim is, it is suggested, an essential factor in securing a successful settlement. Notwithstanding the content, and noting Chappell's comment, it is the author's view based on experience that many claims are flawed in their presentation.

These deficiencies include:

- Incomplete documentation
- Unweildy and poorly bound documentation
- Poor or nonexistent cross referencing
- Charts (if used) that are badly conceived or misleading<sup>92</sup>

The above faults will likely cause the recipient either much annoyance and confusion in attempting to interpret the submission, and it is likely will be reflected in the decision or response returned. It may even lead to the document being ignored, or worse rejected out of hand.

Whilst it is one of the findings of this literature review that there is much to criticise Contractors on their claims management from a planning, programming and controlling aspect, There were very few literature references of any substance found in connection with the all important activity of packaging and presenting evidence in a clear and unambiguous way, which is an essential part of the strategy involved in claims settlement.

---

<sup>91</sup> Chappell - Construction claims /p5/48

<sup>92</sup> Chilvers/Leniar - Litigation support/244

## 2.7 Problematic Issue No. 2 - Contractual & Legal Awareness

### General

The problematic issues in this section concerns the shortcomings in awareness exhibited by Contractors as to the legal status of a claim in that it must be **properly founded, clearly stated and fully supported with evidence** in order to succeed, whether arising under contract or outside the contract.

In the case of the former it will be considered against a background of contract law, and for the latter it will be governed by common law.

### Liability

Problems arise, as has been previously mentioned, when liability cannot, or has not been ascertained. As Hughes noted each party may indeed be a contributor to the matters at fault and allocation of blame will have to be decided upon on weight of evidence and/or judgement.<sup>93</sup> It has also been noted by Capper that the nature of construction activity with the multitude of relationships provides a *"fertile seed bed for legal claims"* ...because...*"multiple lines of involvement obscure the location of responsibility"*<sup>94</sup>

Serious problems have been encountered in recent times on relatively complex construction projects in deciding the question and consequent responsibility for co-ordination activities, whether for design, or management of the works and others. And of course attempting to allocate the blame and quantify the cost effects of failure in these activities.<sup>95</sup>

<sup>93</sup> Hughes/PJK/139

<sup>94</sup> Capper - Construction Disputes-Liability.../p1/118

<sup>95</sup> PJK - 91

The incorrect selection of contract documentation or chosen method of procurement is also a major cause of problems likely to push a claim into a more litigious arena particularly those forms of contract which are heavily amended and often favouring one of the parties.

### Legal Basis

Moving on to the legal validity and basis of claims Smith and Sims sum up this difficult area where they write that *"Building contract claims are a unique combination of law and practice. All contractual as well as common law claims must be founded in law"*<sup>96</sup>

Thus the proper preparation and evaluation of building contract claims requires knowledge of building practice as much as law.

Smith and Sims make the telling point that *"many claims made by Contractors are illfounded, often because the basic principles have been misunderstood"*.

They further add as a cautionary note that contracts ...*"must be read and interpreted against the general background of law ..."*

Chappell notes that as much as *"two thirds of the clauses of most contracts can form the basis of a claim ..."*<sup>97</sup> though he goes on to say that ...*"of course not all such claims would be contractual. Many would be simple claims for damages at common law"*

Many problems are encountered by Contractors when assembling a claim though not least is the question of calculating the effects of disruption in terms of both time and money. The complex interaction of activities in an average building

<sup>96</sup> Smith and Sims - Building Contract Claims/preface/102

<sup>97</sup> Chappell Contractors claims/p18/50



project combined with the uncertain effect of disruptive events whether major or minor can make this task of linking cause with effect and thus quantification of damages (costs) difficult to impossible.

As Hosie points out "*it is not uncommon to see ... a Contractors claim for delay and disruption pleaded on the basis that the Contractor is unable to particularise which event caused which period of delay because of the complex interaction of such events ...*" and consequently the Contractor has ..."*suffered a delay of so many days weeks or months.*"<sup>98</sup>

Thus has developed the practice of attempting to address this situation with the use of "*composite*" or "*global*" claims.

The validity of this "*rolled up*" approach has been the subject of much debate and judicial attention, and is covered in section 2.6.1. Suffice for the moment to list only those principle cases from which direction may be drawn:

*J Crosby and Sons Ltd - v - Portland UDC (1967)*

*L B Merton - v - Stanley Hugh Leach Ltd (1985)*

*Wharf Properties Ltd - v - Eric Cumine Associates (1991)*

*Mid-Glamorgan C. C. - v - J Devonald Williams & Partners (1991)*

The main point that can be taken from a study of the above cases is that the courts still regard it as paramount to **establish causation**, and then to **establish the essential link between the cause of disruption and the effect as far as possible**

Only then in the interests of justice will a composite approach to damages calculation be considered.

### **Spurious or Exaggerated Contractors Claims**



Problems arise where Contractors make spurious or exaggerated claims. These organisations, often labelled as "*claims conscious*"<sup>99</sup> make a habit of presenting claims whether they are justified or not. Alternatively, situations arise where Contractors who having taken on risks under a contract, seek to utilize the claims process to gain relief for the impact of a risk they assumed by contract.<sup>100</sup>

Thus and particularly in times of recession, there are risks that Contractors who bid low to win work do not price contingencies and thus when delays occur (which may well be of their own making), try to avoid contractual liability by raising delay and disruption claims, and in addition '*muddying the waters*' in the process in the hope that this will add to their likely success rate.

Indeed Turner notes that "*there is an attitude emanating from some Contractors that it is better not to have precise evidence, as its absence makes it easier to manoeuvre and gain a higher settlement*".<sup>101</sup>

It must be noted that this approach is considered by industry experts to be a highly risky path to follow, particularly in view of the working mechanisms of the JCT family of contract forms which require warning of claims supported by evidence.<sup>102</sup>

Contractors occasionally forget that as claimant it is they who must justify and prove their claims<sup>103</sup>. Where Contractors do suppress evidence, even by default, they cannot expect to gain the benefit of doubt and may suffer reduced

99           Chapell - Contractors claims/46

100          Bramble/Callahan - Construction Delay Claims/1

101          Turner - Building construction disputes/111

102          Major - 44

103          Turner - 111

settlements accordingly.<sup>104</sup>

In addition to submitting or notifying employers of spurious claims, Contractors are given to exaggeration. The reason put forward to explain this fact is that it is not always possible to be dogmatic in deciding on claims. Some matters which may be the fault of the Contractor will have a contributory factor from the Architect and vice versa. *"Thus in such cases allocation of blame (liability) will have to be decided upon on weight of evidence and or judgement"*.<sup>105</sup> (My emphasis).

Contractors, then, holding the view that claims settlement is all going to come down to a *"horse trading"* negotiation at the end of the job, and convinced that the claim will not be one of simple arithmetic computation of damages on the basis of a few facts, will exaggerate the evaluation of their claims.<sup>106</sup> The purpose being to allow room for negotiation.

If proper attention is paid to the basic principles of properly founding a claim then the many spurious claims submitted by either party to a construction contract would be treated with the contempt they deserve. However the practice of sheltering behind claims in an attempt to correct risks which have turned sour such as bidding low to win work (Contractors, consultants) or starting on site with incomplete designs (employers, promoters) continues unabated, indeed fired by the current recessionary climate.<sup>107</sup>

Powell gives an example of the above concerns when he writes that money claims under JCT 80, clause 26 ... *"are a controversial topic and employers sometimes*

104 Turner - 111

105 Hughes - Anatomy of Quantity Surveying/139

106 Hughes - Anatomy of Quantity Surveying/139

107 PJK/14,51

*allege that the philosophy of some Contractors is to 'tender low, claim high'" and whilst the provisions of clause 26 should not encourage this activity, it quite clearly does confer... " a right to extra payment provided the Contractor relies on it and its mechanism is observed".*

### Contractual Requirements - Written Notices

This latter point highlights yet a further problem within the construction industry and that is the failure by both parties to comply with the mechanisms set out in the contract documentation.

Most notably here is the Contractors failure to submit requisite notices of delay and loss or expense in respect of events which have occurred or are likely to do so. This action invariably affects the Contractors request for extension of time awards and in addition the quantum likely to be recovered. It also affects the Employers' professional team in denying them an opportunity to take mitigating action.

Perhaps this is an aspect the JCT may wish to consider tightening up, for example a sample civil engineering contract clause requires in respect of notifications that *"The Contractor must comply strictly with the procedure set out in clause 12, otherwise he may find he cannot put forward a claim"*<sup>108</sup> Also a case which refers to this issue is that of *Blackford & Son (Calne) Ltd - v - Christchurch Corp 1962*, and whilst the above reference is in connection with civil engineering, the principles are similar to the JCT situation.

### Contract Documentation

Finally turning to the matter of contract documentation, Neale writes that one of the **major differences** between the management of **construction** projects and the management of a **manufacturing** process is ...*"the continual change and*

*development that occurs throughout the life of the project, making the managers task very demanding*"<sup>109</sup>

And, as part of the management remit is the **management of claims**, the actual contract documentation and method of procurement will have a considerable impact on the successful control and settlement of any claims which arise.

In addition Major points out that "*disputes are often unnecessary in ... that they could have been settled amicably at an earlier stage ...*" however this will only happen where "*the parties have a good understanding of the contract provisions governing time and additional money*"<sup>110</sup> Obviously the converse of this is true, as Chappell noted when he wrote Architects are "*not always trained or equipped to handle claims ...*"<sup>111</sup>

Contract documentation may be poorly prepared, deficient or inadequate. There may be discrepancies between documents or even within them.<sup>112</sup> These faults may come about because people are fallible and may be exacerbated through for example pressure of work or an overeager/overbearing Employer prepared to risk starting a project on incomplete information. These types of situation are likely to lead to claims developing which may prove difficult or impossible to manage without the risk of a dispute developing or at least requiring legal input with the cost implication that this entails.

It is perhaps ironic that in many instances an employers desire for '*fast-track*' activity spawns a scenario of costly overruns and bitter arguments with the resultant damage to all parties concerned.

---

109 Neale - Construction planning/p121/128

110 Major - Building and Civil Engineering Claim/pIX/33

111 Chappell - Contract Claims/p26/56

112 PJK/80



## 2.8 Summary and Conclusions

### 2.8.1 Summary

The purpose at this stage of the research project was to conduct a review of technical, professional and academic literature to establish what was already known and published in connection with the topic area of research in order to **identify the problematic issues and difficulties associated with the activity of claims management as practised in Great Britain.**

**Section 2.1 and 2.2** introduced the scope and content of **chapter 2**, describing the approach to the analysis of reference material gathered following an investigation and review of technical and professional literature.

In **section 2.3** the terms **construction claim** and **claims management** were defined in the form in which they are generally applied in the construction industry. The several types and categories of claim were identified, though it was observed that most Contractors claims were contractual in type and concerned critical time delay and disruption claims. Grounds for employers counter claims were also noted.

Claims management was defined with reference being made to the *'life cycle of a claim'*. The importance of the activity was stressed particularly by reference to the author's estimate that as much as £1.2 billion pounds per annum could be under some form of claims management.

The increasing frequency of construction claims was the subject matter of **section 2.4** where it was reinforced that *... "time delay claims are a commonplace reality ...and...have become a an institutionalised part of the construction industry."*

In addition claim activity was on the increase with the recent survey of litigation lawyers reporting a rise in workload and forecasting a **9%** growth rate in the construction and property sector work.



Section 2.5 provides an overview of the 2 main problematic issues identified by the author as giving most cause for concern in the area of construction claims management. It is also at this point that the author made a choice to concentrate on critical time delay claims for the ongoing research rather than disruption of work claims, because of the different approaches required in their analysis and preparation from a claimants perspective.

The problematic issues raised in connection with Contractors efforts to promote and manage time extension claims are identified as Evidence and Contractual & Legal Awareness.

In section 2.6, the many aspects of the Evidence issue are examined and commented upon. It is observed that the identification, gathering, analysis and presentation of evidence in support of a claim is probably the most important activity to be undertaken in the process of claims management.

It considers the logistical difficulties of handling the potentially large quantities of documentation and also lists out the various types of evidence which may be required to be investigated.

The section then falls into five parts dealing with :

- **Construction Delay Claims**

Considered probably the most commonly made, this part considers the difficulties associated with gathering evidence, the question of globality, and the quality and standard of evidence required in the event of formal proceedings. It goes on to define delay claims, discuss how they arise, the causes, the skills required in assessing time extensions and the fact that time claims do not always attract financial reimbursement. The latter being supported by case law examples.

This part ends with reference to some of the problems associated with construction programmes including "as-built" charts, and an observation that if Contractors and Employers' agents made more and better use of planning techniques than a considerable volume of time related claims would not manifest themselves.

- **Construction Programming and Critical Path Analysis**

This part concentrates on the advantages of using CPA techniques, the difficulties encountered by Contractors, and the use of computers.

It was noted that the majority of Contractors do not use CPA techniques effectively, though they represent the best method of demonstrating causality in a critical delay scenario.

One leading author observed however that CPM/CPA is not a panacea, and can only be as good as the commitment, thought, and utilisation of the underlying information used.

- **Causation**

The establishment of causality in a critical delay claim is considered a vital ingredient if a claim is to be successfully demonstrated. It is noted that the Contractor is often the best placed party to deal with the impact of a critical cause of delay and it is incumbent on him to record as fully as possible all relevant details as well as introducing reasonable mitigating action.

The review recognised that it is not always possible to identify each and every single cause of delay and the effect flowing from such.

Nonetheless, causation has to be shown where at all possible based upon evidence gathered. This activity can be greatly assisted by

using computing and information technology.

Problems arise where Contractors are unable or fail to particularise each and every causative event which has given rise to a critical delay and fail to demonstrate or establish a clear link between cause and critical effect. Global claims will not bring relief to Contractors where detail evidence exists.

- **Records**

Record keeping and management is an area fraught with difficulty for the Contractor.

It was noted by one leading commentator that a claimant's failure to maintain adequate records is probably the most usual reason why so many valid claims are abandoned. Several other authors echoed this view.

It is observed that Contractors on occasion not only risk having deficient information to support a claim, but in doing so are in breach of contract for failing to maintain such relevant particulars.

Contractors and Subcontractors often plead that time and resources are needed if they are to heed the oft given advice to keep adequate records.

It is recognised that an economic balance has to be struck in maintaining essential records.

- **Presentation**

The packaging and presentation of essential evidence complete with fully supporting relevant documentation is considered a vital factor in securing a successful settlement to a claim submission.

Whilst this may appear an obvious observation, several sources highlighted examples of deficient documentation presented in a confused or incomplete state.

**Section 2.7** deals with the difficulties which arise through the shortcomings and failings of Contractors to understand or be aware of the contractual or legal basis of their claim.

It is noted that a claim **must be properly founded, clearly stated and fully supported with evidence** to succeed.

This section referred to the problems of establishing liability, the legal basis of a claim, global claims, and the difficulties which arise when Contractors present spurious or exaggerated claims.

It included the matter of Contractors failing to comply with written notice requirements by reference to case law, and ended with discussion on problems associated with the impact on claims management of various forms of contract documentation.

This final **section 2.8** records a summary of **chapter 2** and sets out the authors conclusions.

### **2.8.2 Conclusions**

Based upon the findings of the Literature Review the author draws the following main conclusions:

- That construction claims activity is inevitable given the current building work procurement procedures in operation in Britain, and involves billions of pounds per annum.

That construction claims activity is widespread and forecast to grow

in volume.

- That the size and nature of the industry with its multiple competing professions and its historical adversarial approach to contracting, will, on the current balance of risks, lead to continued incidence of claims arising which will have to be managed.
- The fact that construction claims activity exists on a substantial level, and that this situation is not likely to change in the foreseeable future leads to the conclusion that any improvements which would make the **claims preparation and settlement process** more effective, through reducing or eliminating inherent failings and shortcomings, would provide a direct cost benefit to the construction industry.
- Time delays form the basis of most construction claims.
- Contractors fail to establish and demonstrate causation satisfactorily in time extension request claims.
- If a Contractor is unable to establish causality in a time extension claim, that is the essential link between cause and critical effect, they will find their claim very difficult to prove and so fail to persuade the recipient to reimburse any loss or expense incurred as a result.
- The availability of evidence to prove causality is often lacking.
- The greater the detail that can be shown in a construction schedule or planning programme, the better it will be as a reference from which changes and variations which delay a project can be measured.



- If better use were made of planning techniques by both the Contractor and the Employer's professional team, then the volume of retrospective time extension claims would reduce.
- That British Contractors do not make the fullest use of critical path technique in their construction planning activity.
- The problems of eliminating Contractors culpable delay and concurrency can be resolved using computer-aided critical path techniques.
- Great care must be taken using CPA techniques for delay analysis as a considerable amount of reliance must be placed on the logic linking of activities. Failure to provide these constraints correctly produces an inaccurate picture of the logical progress of the project.
- The advent of powerful yet comparatively inexpensive computing hardware and software, whilst not providing a total solution to Contractors time related problems, at least provides a first class medium for the consideration of related problems.
- There is widespread failure amongst Contractors to provide satisfactory detailed substantiation to the claims they submit
- That the lack of proactive information management of contractual documentation and site records causes considerable problems when attempting to gather supporting evidence for a claim.

And whilst many of the industries leading players are increasingly turning to the use of on-site computer assisted record keeping systems(see section 2.6.4 for references) many more continue to employ archaic and inefficient systems unable to cope with the

considerable demands of tracking the flow of information, processing of data and distribution.

- It is recognised that Contractors resources are finite, and that a line has to be drawn on the amount of expenditure allocated to information management and record keeping. It is concluded therefore that an optimum economic balance must be struck according to the given situation on each individual contract.
- Contractors fail to understand the contractual or legal basis of a claim which leads on occasion to incidence of spurious or exaggerated claims being raised.
- Where insufficient evidence is available it may be possible to present a '*rolled up*' or '*global*' claim.

### 2.8.3 The next stage

The next stage comprises the undertaking of an **Industrial Survey**, the purpose of which will be to establish the nature and scope of problems currently existing in practice. This review will include the use of a questionnaire circulated within the construction industry in order to gather **primary data** for analysis.

# CHAPTER THREE

## INDUSTRIAL REVIEW AND SURVEY

---

---

- 3.1 Introduction**
  - 3.2 Collection of Primary Data Methodology**
    - 3.2.1 Sample Selection
    - 3.2.2 Data Collection
  - 3.3 Design of the Questionnaire**
    - 3.3.1 Layout and Structure
    - 3.3.2 The Questions
    - 3.3.3 The Questionnaire
    - 3.3.4 Test of Questionnaire
  - 3.4 Survey Response and Presentation**
    - 3.4.1 Analysis and Presentation Methodology
    - 3.4.2 Logistics of Survey Response
    - 3.4.3 The Statistical Results
  - 3.5 Analysis and Interpretation of Survey Findings**
    - 3.5.1 Response to Extension of Time Claims
    - 3.5.2 Failure to Link Cause and Effect
    - 3.5.3 Evidential Matters - Records
    - 3.5.4 Low Investment in Computerisation
    - 3.5.5 Cost of Claims Preparation
  - 3.6 Conclusions**
    - 3.6.1 Introduction
    - 3.6.2 General Observations
    - 3.6.3 Summary of Major Findings
    - 3.6.4 The Next Stage
- 
-

## INDUSTRIAL REVIEW AND SURVEY

---

### 3.1 Introduction

For the Literature Review in **chapter two**, an extensive search and review of existing technical, professional, and academic literature was undertaken which established, in particular, what is currently written and known about the problematic issues in the area of construction claims management.

From this exercise several main heads of difficulty were identified, together with an indication of the potential gaps which may exist between such areas, and solutions currently available.

**The main aim of this section is to investigate from an industrial practice perspective what the principal problems and/or failings in the process of claims management are, and whether there exists scope for positive beneficial improvement, particularly by the potential application of computer aided technology and systems.**

The author's investigation took the form of a survey of the British Construction Industry, employing statistical research practice techniques, to collect Primary Data, the methodology findings and conclusions of which are contained within the body of this chapter.

Claims are initially generated in the main by construction companies of all sizes, and from all regions and accordingly the survey was aimed specifically at this sector.

For reference, the author defines construction companies as "*businesses units engaged principally in the practice of undertaking and executing construction work<sup>113</sup> under contract, whether acting in the role of a Contractor, (otherwise known as 'main', 'head' or 'lead', or as a Subcontractor.*"

The survey sought to gain in particular the following:-

- Identification of the main problematic issues concerning Contractors preparation of time extension claims.
- Identification of the frequency of time extension claims being submitted, and an observation of the responses made.
- Assessment of the success or failure rate being recorded by Contractors.
- Identification of the nature and scope of computer usage by Contractors in the area of time management and analysis operations, and an indication of current attitudes towards the implementation of computer-aided systems in claims management.
- Verification that the core area of the research project and consequent hypothesis were valid.

---

<sup>113</sup> Category includes new work, repair and maintenance and covers public and private sectors



## 3.2 Collection of Primary Data Methodology

The first stage in this investigation was the collection of data which was undertaken as carefully and correctly as possible. It would clearly have been impossible for the purposes of this research project, to collect data from or survey the whole '*population*' (that is all the construction companies trading which currently number in excess of 50,000) so as representative a sample as possible was selected. This also had the effect of reducing the data to manageable proportions and kept the cost of data collection within reasonable parameters.

### 3.2.1 Sample Selection

Having identified the '*population*' from which the sample was to be obtained, namely construction contracting companies, a '*sampling frame*' was compiled comprising a random listing of 2,423 construction companies of all sizes and geographical locations. The listing was divided into 6 regions - North East, North West, South East, South West, The Midlands and Scotland.

The sampling method then consisted of selecting names at random from these listings, the only discretionary imposition being that a certain number be selected from each region to ensure a reasonable geographical spread of response. The total number of questionnaires sent totalled 345, some 14% of the sample frame, and were spread as follows:-

●	North West	50
●	North East	50
●	South East	85
●	South West	85
●	Midlands	25
●	Scotland	50
		—
		345
		—

By response 175 valid completed questionnaires were received representing a good response rate of 50.1%. This being achieved without the necessity to send out reminders. A logistical breakdown of the returns is to be found in the data analysis in paragraph 3.4.

### **3.2.2 Data Collection**

Having selected the sample, one of the three principal methods of collecting data had to be chosen. The three main ones comprising:

- The Personal Interview
- The Postal Questionnaire
- Observation

In this case the Observation method was not appropriate for this type of study, and the Personal Interview being far too restrictive, time consuming and expensive, left clearly the most advantageous method being the self completion Postal Questionnaire. The main advantages of this method being:-

- It was the least costly compared to the alternatives.
- The sample could be collected from a much wider area.
- The bias of the interviewer is removed.
- The respondent is not asked to give instant replies so that answers could be considered and records consulted before responding if necessary.

One of the main disadvantages of this type of self completion questionnaire is that it might not be answered in sequential order. However, in this case the data would not have been affected.

In order to ensure as high a response rate as possible, particularly as the questionnaires were each being targeted to the most senior individuals within the

companies,<sup>114</sup> each questionnaire was sent under cover of a one page letter setting out succinctly in 4 brief sentences the nature of the survey, together with a stamped addressed envelope. See **appendix D** for letter sample.

In addition each letter had the individuals name handwritten at the salutation and was signed personally, and each envelope had the persons name and address handwritten. The author holds the view that this technique at least gives the questionnaire being sent a fighting chance of reaching the target uninterrupted by the normal office/secretarial interventions. It is considered that the extra effort, together with the design of the questionnaire contributed positively to the 50% response rate returned.

Each questionnaire carried a request for a telephone interview with a positive response rate of 19%, or 33 individuals willing to provide additional information. Many other respondents identified themselves, despite the questionnaires provision of confidentiality if required, and only 15% actually declined to give further information.

### **3.3 Design of the Questionnaire**

#### **3.3.1 Layout and Structure**

In view of the fact that this survey was being targeted towards principals and very senior individuals within construction enterprises with many more important priorities on their desks far greater than completing "*yet another form*" it was essential that the questionnaire be as short as possible, easy to read and understand and capable of completion within a matter of minutes.

This is obviously a tall order if the data collected is to be useful, but the author having been personally requested in a professional capacity to complete such

---

<sup>114</sup> See Appendix G for a listing of respondents, job titles/positions

questionnaires on several occasions, set about designing a form to comply with the above factors.

It was decided to limit the number of questions to 20 maximum and elect for multiple choice questions requiring only a *"tick in the appropriate box"* response. The layout of the questions was carefully considered to prevent as far as possible confusion or ambiguity, and to ensure the offered alternative answers were clearly associated with the questions being asked. This however, proved to be expensive in terms of space allowing no more than 2 to 3 questions to be posed on each page.

When the first draft was prepared, despite the layout of questions and their alternative answer boxes meeting the strict criteria of clarity, the questionnaire ran to some 8 pages! Not only did the author believe this would put off the respondents and thus hinder the chances of a good response rate, but it was unnecessarily wasteful of paper.

It was therefore decided to reduce the A4 sheets to A5 and print on both sides. The end result was a questionnaire comprising 2 no. A4 sheets containing 20 multiple choice questions capable of being answered, by the targeted individuals, in a matter of a minutes, with minimal research if any being required. See **appendix E** for sample copy.

The structure of the questionnaire was designed to lead the respondent from 3 simple opening questions to establish the **BACKGROUND** of the organisation through to 2 no. cluster arrangements of questions, 7 questions dealing with claims matters and in house resources under the section title **CONTRACTUAL CLAIMS MANAGEMENT**, and 10 questions following in on issues of time extension claims and attitudes to computerisation under **COMPUTING TECHNOLOGY**.

The survey was anonymous (save a discrete geographical marker), to encourage a higher level of response, and to afford the respondent opportunity to answer the



questions more '*honestly*'.

### 3.3.2 The Questions

Having reviewed various authorities<sup>115</sup> on the design of effective questions, the author decided, based on the advice contained therein, that the format which would most suit the purpose of this survey would be closed, multiple choice questions, enumerated and with ample space allowed for tick response answers. Some questions for example required only a simple Yes/No response. Sliding scales were used on several questions to cater for a range of responses.

The author attempted to avoid any complex questions requiring even slightly difficult calculations, and/or any real effort in research. Also care was taken not to present '*leading*' questions, those requiring unreasonable reliance on memory, or irritatingly repetitive ones.

Every attempt was made to construct the questions with the greatest clarity, neutrality, and to avoid the building in of any hidden bias. The reasonably balanced response rate suggests that no serious bias or distortion will seriously affect the finding as a result of those that did not return the questionnaire.

Turning to the design of the questions, and bearing in mind the fairly onerous requirements set out above, the first task was to consider what response was required? What actual answers were being sought eg. numerical facts, comments, views, attitudes etc? Why the questions were being asked? and what would be done with the information once gathered.

The above criteria were applied as a test to each question to assist in checking the relevance and accuracy of same.

---

<sup>115</sup> See bibliography



The main aim of the questionnaire was to gather and assess views and attitudes, together with the frequency of incidents occurring related to claims management all from a broad range of construction contracting companies.

### 3.3.3 The Questionnaire

The questions were drafted accordingly with the *'purpose'* and *'usage'* being identified for each, and are reproduced below complete with such relevant notation. See **appendix E** for sample of final questionnaire.

"The first 3 questions sought to collect data in connection with the **BACKGROUND** of the sample:

***"Q1 Which category best describes your organisation?"***

**Purpose:** To identify respondents main activity.

**Usage:** To contrast responses received from companies who clearly differentiate their identities.

***"Q2 Indicate the main geographic spread of the companies contracting activity"***

**Purpose:** To identify the spread of the survey response.

**Usage:** To test for regional variations and ensure a reasonably representative sample.

***"Q3 What was the companies turnover in the last financial year?"***

**Purpose:** To establish approximate size of companies output.

**Usage:** To contrast responses received from a range and ensure a reasonably representative sample.

The next 7 questions related to **CONTRACTUAL AND CLAIM MANAGEMENT**

matters:

**"Q4** *What is the frequency with which, during the past 2 years, you have required to execute works under any of the JCT (Joint Contracts Tribunal) Standard Forms of Building Contract?"*

**Purpose:** To identify usage of JCT forms.

**Usage:** To establish link with research requirement and contrast with findings in questions 5, 6 and 7.

**"Q5** *Where work has been undertaken under JCT Forms of Contract, how often has need arisen to submit extension of time claims?"*

**Purpose:** To identify the frequency of claims made under JCT forms by the survey sample.

**Usage:** To establish link with research requirement and contrast with finds in questions 5, 6 and 7.

**"Q6** *Where claims are submitted for an extension of time under the JCT forms, on how many occasions has an award been made which has been deemed satisfactory?"*

**Purpose:** To establish the "strike rate" of claims submitted.

**Usage:** To prepare graph/chart for further analysis.

**"Q7** *In the year ending December 1992 has it been necessary to commence arbitration or litigation proceedings on any job covered by a JCT contract?"*

**Purpose:** To establish the incidence of "claims management failure".

**Usage:** To identify the scale of the problem and confirm the

validity of seeking a solution.

**"Q8** *If so on how many occasions?"*

**Purpose:** To identify the frequency of failure.

**Usage:** To identify the scale of the problem and confirm the validity of seeking a solution.

**"Q9** *Does your company directly employ individuals assigned solely to working on, and/or advising in connection with contractual time and money claims?"*

**Purpose:** To identify resource level within companies committed to pro-active claims management and dispute avoidance.

**Usage:** This test of the CI's attitude may further indicate the scale of reasons for the poor claims management performance by reference to the resources allocated to this area of work. This information will be reviewed when solutions are being structured.

**"Q10** *Does the company employ external consultants to work on, and/or advise in connection with contractual time and money claims?"*

**Purpose:** To identify frequency of need to input claims management expertise.

**Usage:** To assess potential costs incurred by companies, and also to contract and cross refer with questions 5, 6, 7 and 8.

The final 10 questions, whilst still firmly concerned with claims management concentrate on gathering data in connection with attitudes and usage of

**COMPUTING TECHNOLOGY:**

*"Q11 Are computers used by the company on construction site location?"*

**Purpose:** To identify broad exposure to computerisation on site.

**Usage:** This information will be used to verify the type of problems being identified prior to solution formulation.

*"Q12 Where computers are used on site locations please indicate the tasks they perform"(10 tasks listed for selection)*

**Purpose:** To identify in more detail the specific tasks most frequently performed on site where computer technology used.

**Usage:** This information will be used to verify the type of problems being identified prior to solution formulation.

*"Q13 If it were possible to improve the companies success rate in successful claim settlement using computerisation, would you be more in favour, or less in favour of investing in this technology?"*

**Purpose:** To identify attitude to investment in computer technology.

**Usage:** This information will be used to verify the type of problems being identified prior to solution formulation.

*"Q14 Indicate below whether in your opinion the following areas of claims management would be more improved or less improved by the use of computerisation?" (8 areas are listed for choice).*

**Purpose:** To identify respondents views on potential computer aided solutions to common claims activities.

**Usage:** To assist in the formulation of prepared solutions.

The next 3 questions concern **construction programmes** and **critical path** analysis methods:-

*"Q15 On how many occasions are your construction programmes prepared using computer technology?"*

**Purpose:** To establish incidence/frequency of computer usage in this particular key area.

**Usage:** This information will be contrasted with responses given to other questions in this section when formulating solutions.

*"Q16 On how many occasions are your computer generated construction programmes based on a critical path network?"*

**Purpose:** To narrow the line of enquiry and identify the usage of computers in construction planning.

**Usage:** This information will be contrasted with responses given to other questions in this section when formulating solutions.

*"Q17 On how many occasions are your extensions of time claims based on critical path analysis?"*



**Purpose:** Again to identify frequency of using computer programme analysis techniques particularly in this more unusual practice.

**Usage:** This information will be contrasted with responses given to other questions in this section when formulating solutions.

The next question deals with the essential joint activities of *'record keeping'* and *'progress monitoring'* is central to the area of research being undertaken.

*"Q18 If it were accepted practice to maintain a common set of AGREED site progress records with the Employer on a regular basis throughout the contract period do you consider this would improve, or not improve the settlement of extension of time claims?"*

**Purpose:** To test the respondents attitude to this concept.

**Usage:** To assist in validating proposed solution(s).

*"Q19 If you have had an extension of time claim (or claims), under ANY form of contract, rejected either in part or in total during the last 12 months, please indicate the reason(s) given by the recipient of the claim" (7 common reasons listed for respondents selection)*

**Purpose:** To identify frequency and predominance of the most common reasons for claim rejection.

**Usage:** This data will be used to assist in validation of the problem chosen for research and concentrate direction of solution selection.

*"Q20 Does your company follow a BS 5750 procedure for maintaining site documentation? (ie correspondence, invoices, delivery notes,*

*day work sheets etc)*

**Purpose:** To identify respondents attitude to systems and organisation standards particularly records.

**Usage:** This information will be contrasted with responses given to other questions in this section when formulating solutions.

A further question was included:-

*"Q21 Would you be prepared to answer a number of brief additional questions by telephone interview".*

**Purpose:** This is self explanatory.

Prompts were included inviting the respondent to give their *"NAME", "POSITION" and "DAYTIME TELEPHONE NUMBER"* together with *"DATE (each) questionnaire (was) completed...."*.

And finally, although the questionnaires allowed unidentifiable confidential responses, each document was discreetly marked with the region to which it was being sent.

#### **3.3.4 Test of Questionnaire**

Once the questionnaire was finalised as to content and layout, draft copies were provided for pilot studies to be undertaken by colleagues. Under tests a questionnaire took between 10 and 20 minutes to complete, where a response was made to each question. Following these trials minor amendments were made to clarify a number of points and to rephrase questions to avoid ambiguity.

### **3.4 Survey Response and Presentation**

#### **3.4.1 Analysis and Presentation Methodology**

The questionnaire was based on a simple tick sheet or '*tick in the box*' approach. There were 96 boxes of which a maximum of 44 ticks might have been required which as previously stated took on average 10 to 20 minutes to complete all questions.

The data collected in this format was then input to a flat file database spreadsheet model prepared for this analysis using Lotus 123 (*Version 2.4*) where the responses could be sorted, consolidated, interrogated, processed and where percentages and ratios could be calculated as required for individual queries or the sample as a whole.

Each question was coded for query/sort purposes, and all the records were printed off into hard copy schedule format. See **appendix F**

Additional information including details of the respondent are listed in a second schedule. See **appendix G - ADDITIONAL INFORMATION**.

Presentation of the data will largely be confined to descriptive statistics, which initially will comprise being reported in tabular form (*paragraph 3.4.3*) and later, following interpretation, using diagrams, charts and graphs to support typed narrative.

#### **3.4.2 Logistics of Response**

The sample frame size was 2,423 from which 345 were chosen at random save for a geographical selection. A total of 196 (57%) questionnaires were returned of which 175 were properly completed. The remainder comprising questionnaires returned blank by the target company, the post office, or in some cases fell outside

the category. Thus a total in excess of 3,500 pieces of data was gathered for analysis and interpretation.

Of the valid 175 questionnaires received from the sample the response rate was **50.1%** and was broken down on a regional basis as shown in **table 3.1**

<b>REGIONAL ANALYSIS :</b>			
Region	No. Sent	No. Returned	Response Rate
Scotland	50	28	56%
North West	50	20	40%
North East	50	31	62%
Midlands	25	13	52%
South West	85	40	47%
South East	85	43	48%
	<b>345</b>	<b>175</b>	<b>50.1 %</b>

**Table 3.1 Regional Analysis**

The main geographic spread of the responding companies is shown in **table 3.2**.

	Contractor	Subcontractor	Total	%
National	59	17	76	44
Regional	41	5	46	25
Local	46	7	53	31
	<b>146</b>	<b>29</b>	<b>175</b>	<b>100</b>

**Table 3.2 Main geographic location of responding companies.**

The 175 respondents are also further identified in **figure 3.1** by their declared principal activity of the comprising 146 *main* Contractors (83% of sample) and 29

Subcontractors (17%).

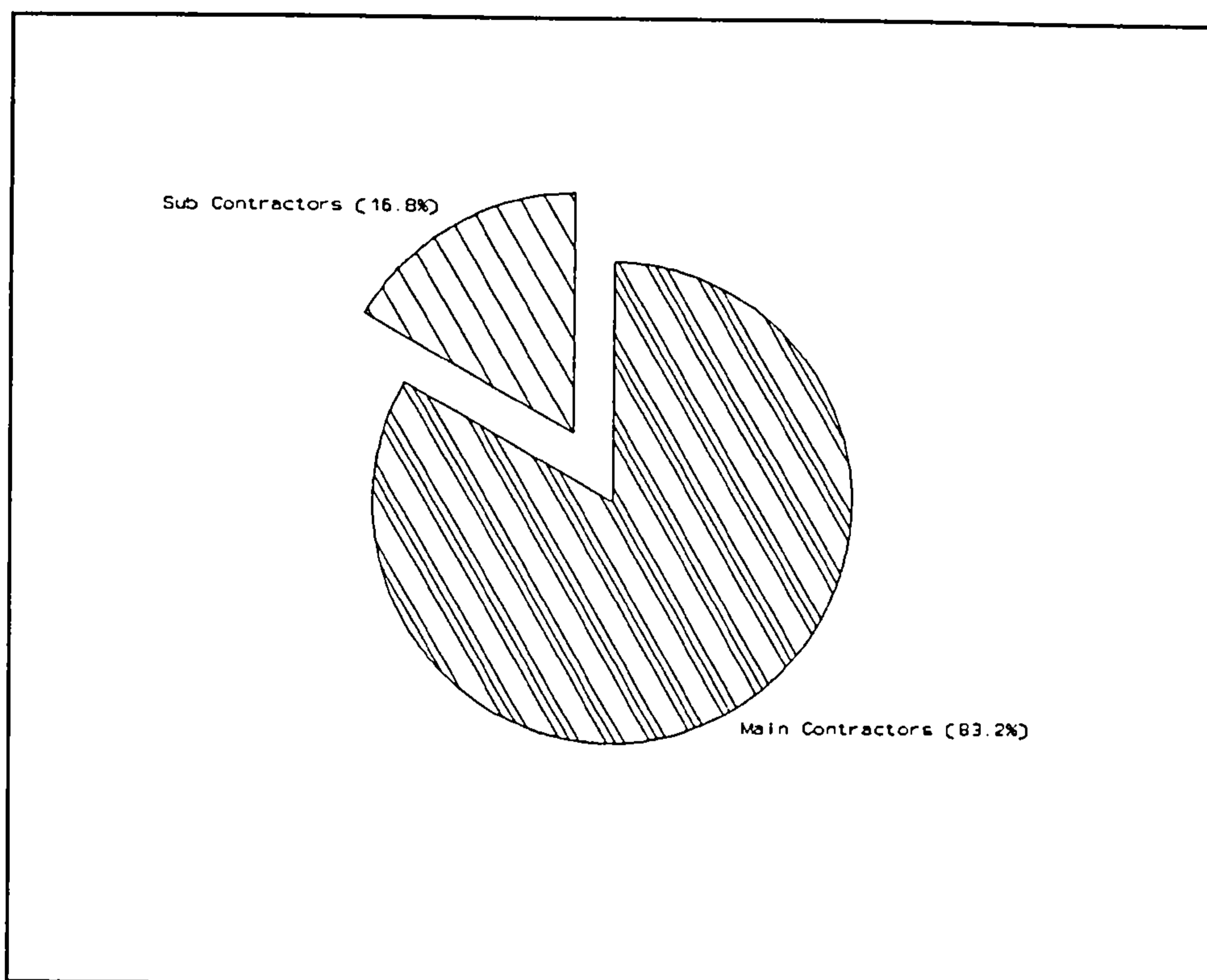


Figure 3.1 Principal trading activity of company.

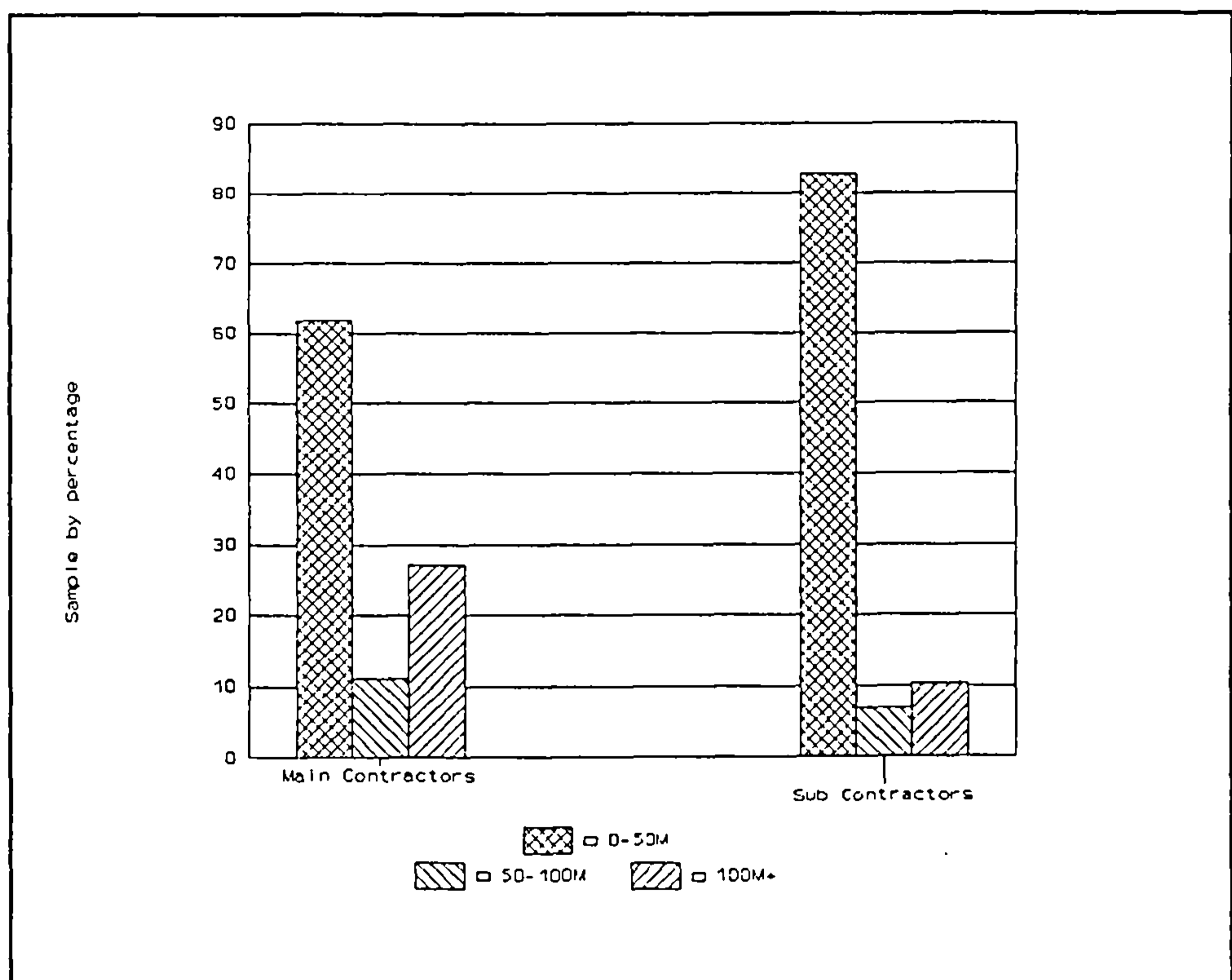
Of those 59 individuals who identified themselves on the questionnaire (see column 5 marked "*position*" of schedule in appendix G) their job or positions were generally described as:

- Director 27 All of a Senior/Chief level and including Chairmen.
- Surveyors 20 Including Quantity Surveyors.
- Managers 10 Various including Project, Commercial/Computing etc.
- Legal 2 Solicitors



The above demonstrates the high level of company management at which the questionnaire was received, and responded from.

The financial status distribution of the participating companies was established by question 3, and is shown in **figure 3.2** and set out in **table 3.6**. It was observed that whilst the largest single category of respondents fell into the £0-50 million pound turnover category, 42 no. were in the £100 million pound plus bracket. A conservative estimate of the total turnover of the sample is £6.2 billion pounds, which if measured against a construction industry turnover of £35 billion pounds (reference section 2.3.4) indicates the sample represented some 17.5% of total industry output.



**Figure 3.2** Turnover in the last financial year.

Finally, as this research was focusing on building work in Great Britain, much of which is executed using one of the JCT family of contract forms, question 4 sought to establish the frequency of usage. **Table 3.3** sets out the response to this

enquiry which clearly shows a high degree of usage, with almost half the sample working on these forms on over 75 % of their jobs.

<b>Whole Sample</b> %	<b>Main Contractor</b> %	<b>Subcontractor</b> %	
<b>Over 75%</b>	<b>46</b>	<b>51</b>	<b>24</b>
<b>Over 50%</b>	<b>20</b>	<b>15</b>	<b>41</b>
<b>Over 25%</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Less than 25%</b>	<b>15</b>	<b>14</b>	<b>17</b>
<b>Not at all</b>	<b>9</b>	<b>10</b>	<b>8</b>
	<b>100</b>	<b>100</b>	<b>100</b>

**Table 3.3** Frequency of executing work under JCT contracts in the past 2 years.

### **3.4.3 The Statistical Results**

The responses to the questionnaires were converted to statistical data in the form of a schedule of tabular and descriptive statistics and are bound separately in **appendix H**.

This information was analysed, with interpretations and deductions being drawn and set down in narrative form in the following sections.

### **3.5 Analysis and Interpretation of Survey Findings**

From the author's interpretation of the survey findings it is concluded that there are several problems currently experienced by construction companies in the area of claims management as previously defined in section 2.3.5 and further elaborated in paragraph 2, section 2.4.

At this stage in the investigation process the author chose to focus primarily on problems related to the core area of the research namely **claims for time overruns, and the opportunities presented by computerisation to remove the difficulties of accurately assessing and awarding such.** Therefore it is this particular area upon which the identification of problems is confined.

This section sets out under several headings the principal problematic issues as identified.

They are listed in summary below and set out in further detail in the following text. The problem issues identified are concerned with:

- **Response to extension of time claims**
- **Failure to link cause and effect.**
- **Evidential matters - Records.**
- **Low investment in computerisation.**
- **Cost of claims preparation**

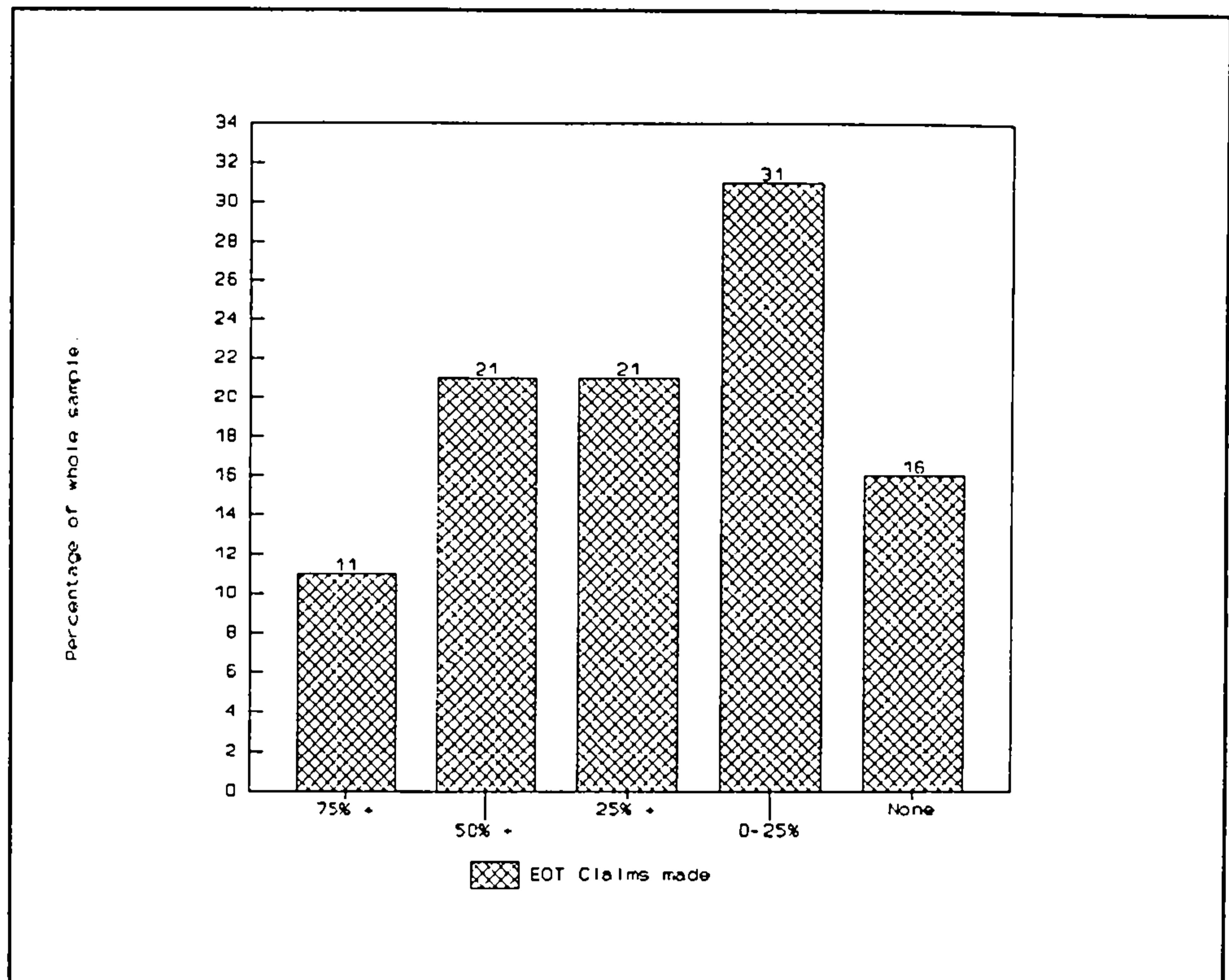
By way of reminder of the convention used in the following text where percentage figures are shown, the reader is asked to note that the first figure is for the sample as a whole, and where figures are given in brackets the first relates to the '*Contractor*' portion of the sample and the second to the '*Subcontractor*' portion for example:

31% (28%/52%) should be read - 31% [*of whole sample*] (28% [*Contractor sample*] 52% [*Subcontractor sample*]).

### **3.5.1 Response to Extension of Time Claims**

It was observed that there is a very high incidence **84% (84%/86%)** of **Contractors** submitting extension of time claims on one or more occasions on contracts where a JCT Form is used, (as shown in figure 3.3), with **32%**

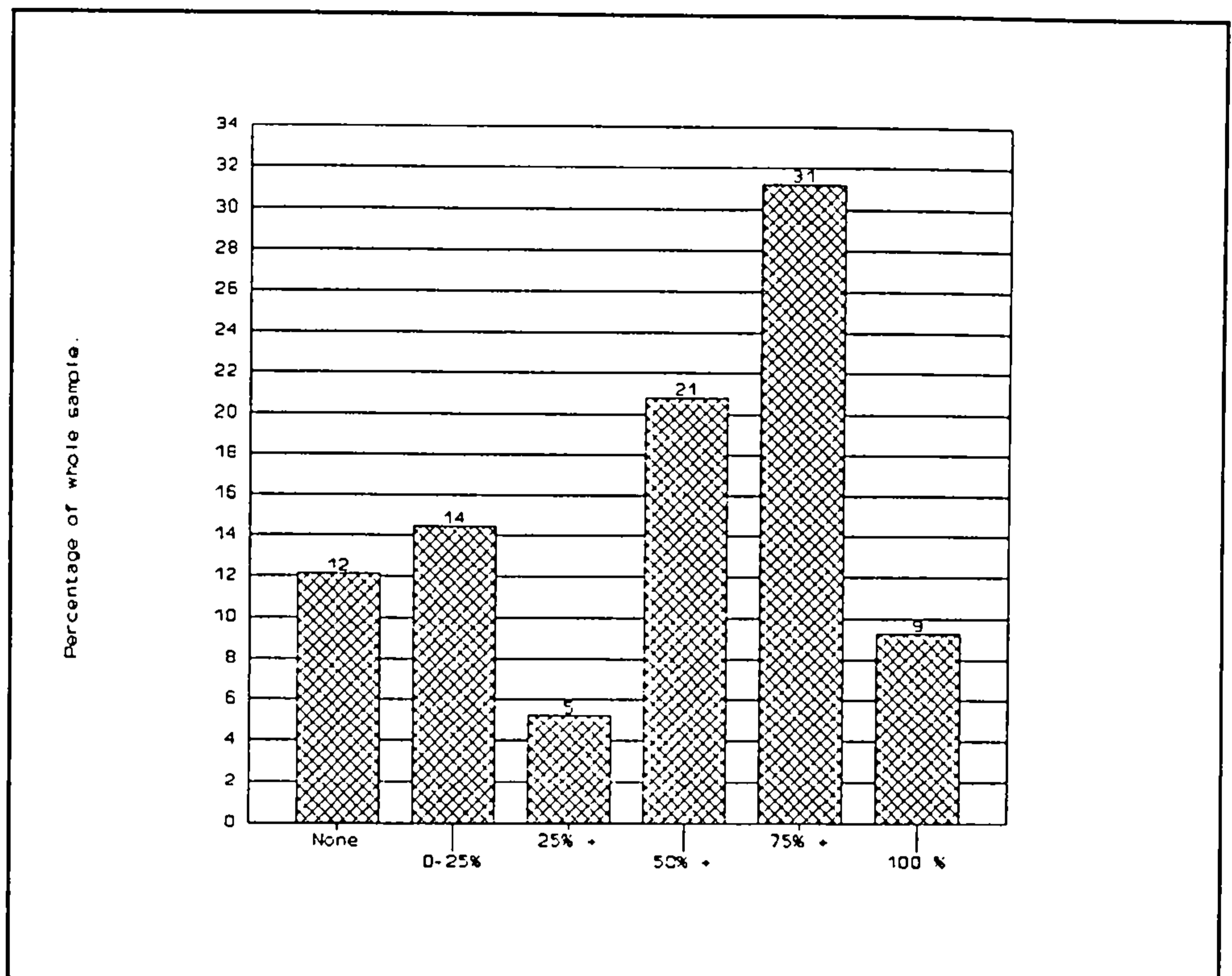
**(33%/24%) making a claim on more than ½ of their jobs.**



**Figure 3.3 Frequency of need to submit a time extension claim on a JCT governed contract.**

This would indicate that there is potentially a serious problem in constraining construction on projects to a predetermined fixed timescale. This regardless of whether the original timescale is realistic or otherwise, imposed by the Employer or not, changes imposed on the works, or the works properly managed or mismanaged by the Contractor.

Having submitted a time extension claim a substantial number of Contractors, 83% (83/86), in the survey were dissatisfied with the outcome on more than one occasion with 31% (28/52%) being dissatisfied with more than half of all awards made. Only 9% (9%/10%) of the respondents recorded that they were satisfied on every occasion. See figure 3.4.

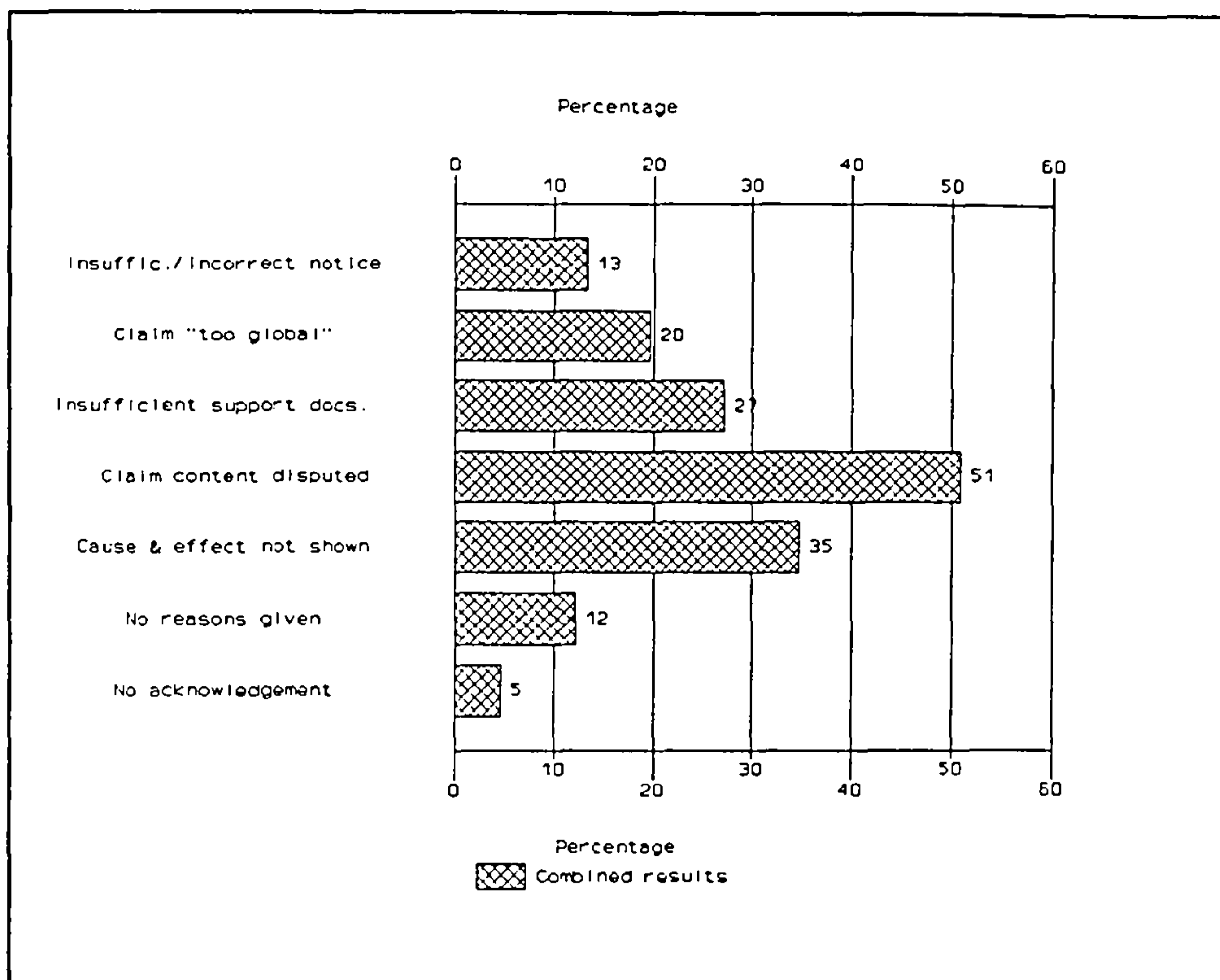


**Figure 3.4 Satisfaction rate of awards made.**

It will be observed however that whilst there was little difference above between the views of Contractors and Subcontractors on the overall picture of occasional unsatisfactory awards ie (83%/86%), there was a significant difference on the higher incidence of claims with over half of the sub contracting element of the sample being unhappy on 1 in 2 claims!

Several reasons were given for claims being rejected as shown in figure 3.5. The most significant observation was the high number (35% of the sample) of claims being rejected for the reason given that cause and effect had not been demonstrated.





**Figure 3.5 Reasons given for claim rejection**

Claims were also rejected because Contractors had failed to provide sufficient support documentation (27%) and because the claims were *"too Global"* (20%).

A further reason given for claim rejection, though not necessarily always fatal to an extension of time request, is the matter of insufficient and/or incorrect notices having been given (13%). This however is a growing area for concern particularly with the importation to Britain of aspects of the American forms<sup>116</sup> of contract making such notices condition precedent.

**12% of the sample recorded that no reasons were given and 5% noted that they had received no response at all!**

Other ad hoc reasons were volunteered by the respondents which demonstrates

<sup>116</sup> For example the AIA (The American Institute of Architects) General Conditions of the Contract for Construction

further the breadth of responses and attitudes prevalent in the industry to what is clearly an emotive topic despite the fact that a claim for further time is basically a simplistic mechanical procedure under most forms of contract.

The reasons given are set out as follows, accompanied by a cross reference to the actual questionnaire filled in :-

- *"Further and better particulars requested"* (004).
- *"Contractors fault"* (062).
- *"Extension deemed hypothetical"* (078).
- *"Compromise settlement" (offered)* (050).
- *"Disputes arise as to whether periods (of prolongation) carry loss and expense"*. (031).
- *"Withdraw or be removed from the tender list"* (068).
- *"As a Subcontractors we are manipulated by the Main Contractors Agreement with the Architect/Employer!"* (081).
- *"Valuation method disputed"* (148).

### **3.5.2 Failure to Link Cause and Effect**

The author submits from his own practical experience of such matters that it is simply impossible to effectively or accurately establish and demonstrate the link between a delaying event or cause and its direct effect on a construction project without employing even the most rudimentary computer technology save only where the contract works are very simple in nature (say 20 activities or less), or alternatively where there are only one or two major and quite separate delays requiring a total shutdown of works. Other than these examples, the complex, logistical and financial parameters within which modern construction projects are constrained render full manual analysis of time extension claims almost impossible.

It is therefore significant to discover as shown in figure 3.5 that some 35% of Contractors have claims rejected for failing to link cause and affect, particularly when this data is weighed against the finding that only some 50% of Contractors employ computers on site. Refer to figure 3.6 for an indication of the frequency with which Contractors use computers on construction site locations. It is noted however that some 59% readily agreed with the proposition that this was an area most likely to be improved by computerisation.

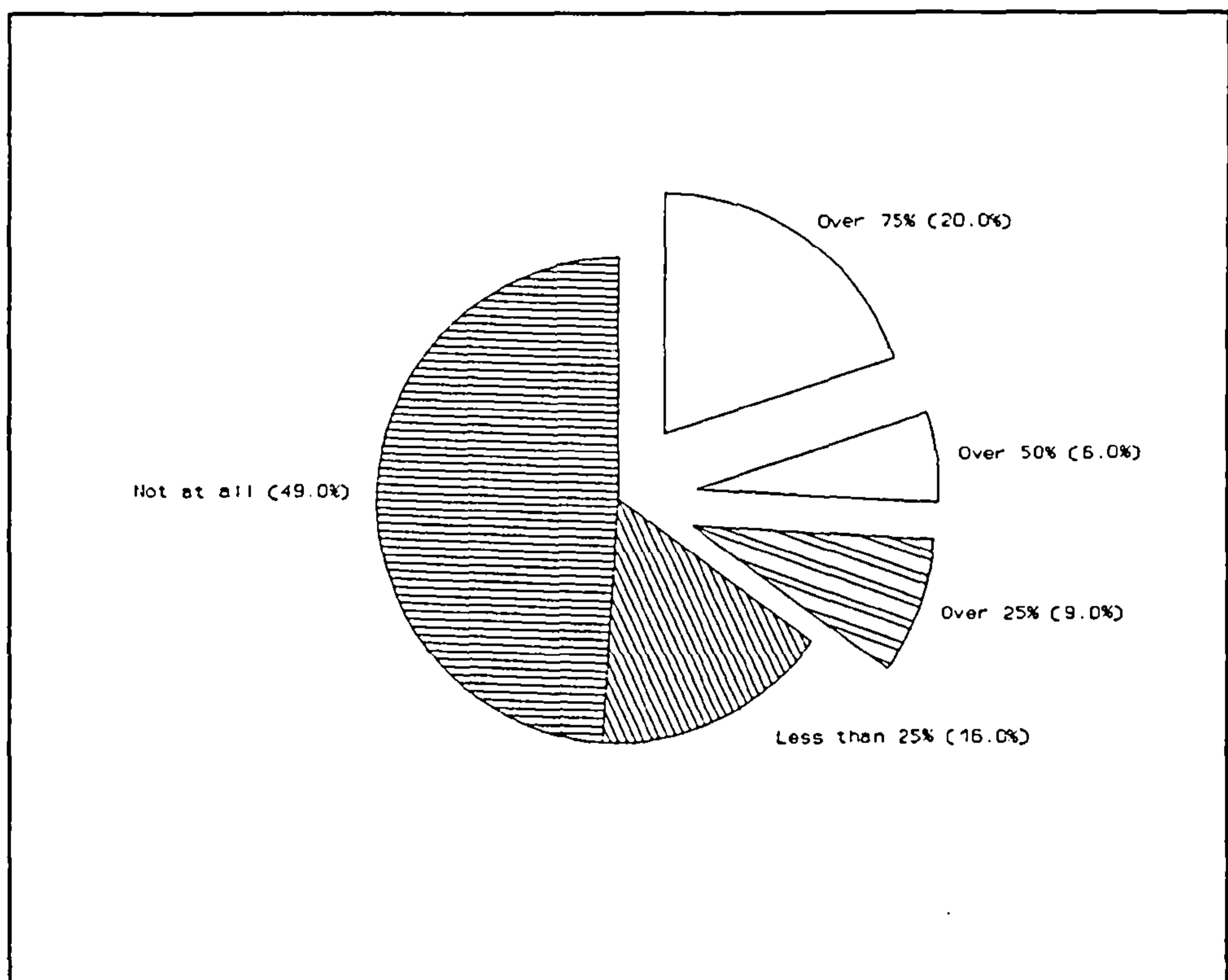


Figure 3.6 Frequency of occasions on which Contractors use computers on site.

Nonetheless, accepting for the moment that central to truly effective analysis of time delay claims is the systematic analysis of the construction programme, particularly employing critical path planning techniques retrospectively, it was observed that 32% (30%/38%) of Contractors never prepared their construction



programmes using computer technology.(See figure 3.7) And of those 68% (70%/62%) that did 36% (35%/45%) never based their programmes on critical path analysis.

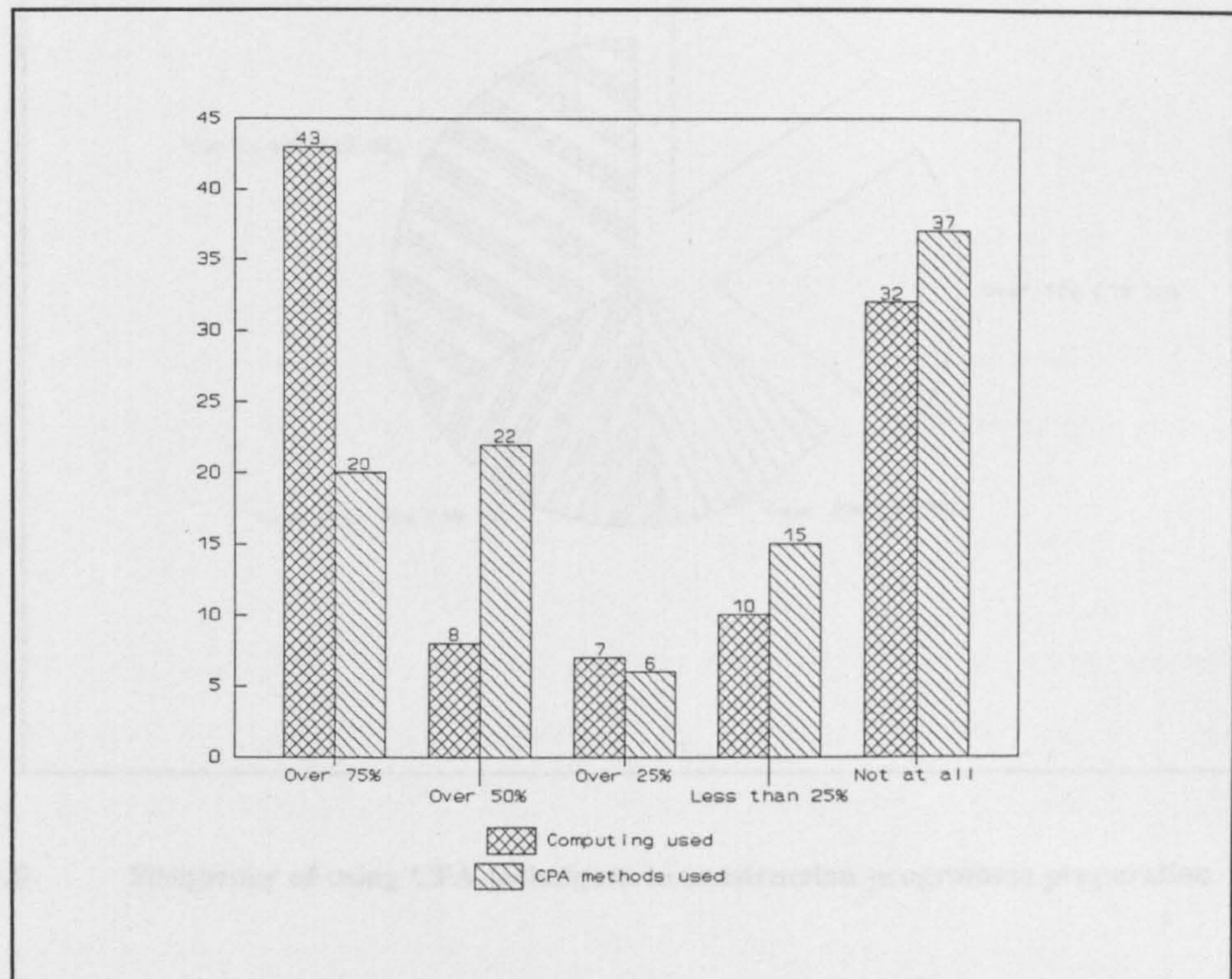
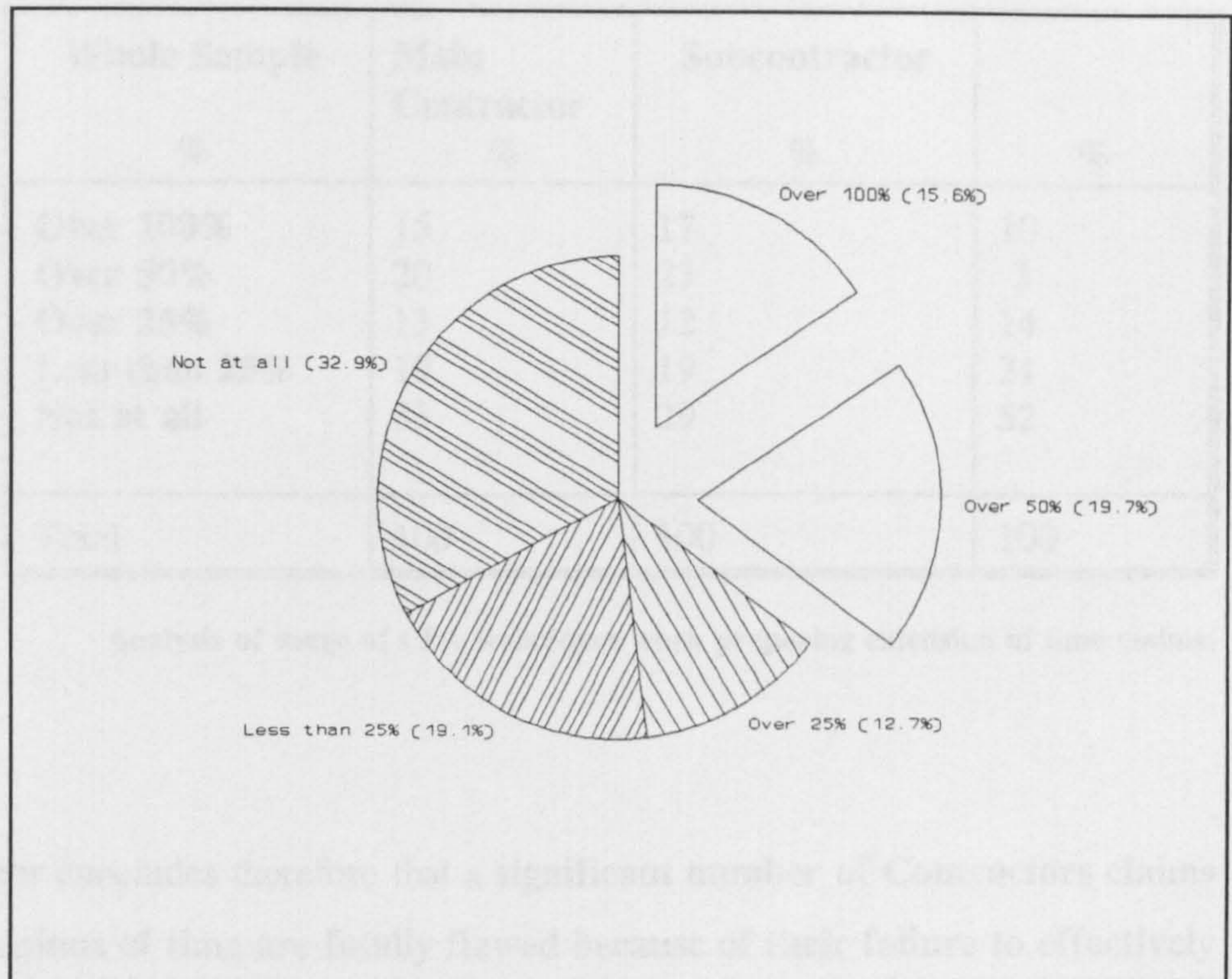


Figure 3.7 Usage critical path techniques and computerisation by Contractors when preparing construction programmes.

In conclusion therefore, it is not surprising that of all those Contractors that submitted extension of time claims, I found that 52% of respondent companies failed to calculate their assessments using critical path analysis techniques on most occasions with 32%(29%/52%) never doing so.





**Figure 3.8** Frequency of using CPA techniques in construction programme preparation

**Figure 3.8** provides a graphical illustration of the spread of usage, and in **table 3.4** a detailed analysis of the response is shown in which it is significant to observe the marked contrast between Contractors and sub-contractors activity in this area.

Again it is significant to note the different responses between the main Contractor and Subcontractor element.



Whole Sample %	Main Contractor %	Subcontractor %	%
Over 100%	15	17	10
Over 50%	20	23	3
Over 25%	13	12	14
Less than 25%	19	19	21
Not at all	33	29	52
Total	100	100	100

**Table 3.4** Analysis of usage of CPA techniques when preparing extension of time claims.

The author concludes therefore that a significant number of Contractors claims for extensions of time are fatally flawed because of their failure to effectively demonstrate causation and/or the causal link to the satisfaction of the Employers professional team, or as the occasion demands it an arbitrator or judge.

There are a number of important landmark cases in English case law to this area of claim type, which are set out in the Table of Cases in the preambles to the thesis, and in chapter 2.

The author draws the conclusion that poor investment in computer technology and computer programme analysis techniques significantly contributes to this failure. Additional reasons include failure to provide satisfactory evidence which will be referred to in paragraph 3.5.3.

### **3.5.3 Evidential Matters - Records**

To succeed in an application for extension of time one fundamental requirement is for the claiming Contractor to produce adequate documentation and records of a supportive nature sufficient to persuade the assessor of the claim that an award

is due.

For some time now the maintaining and processing of records, particularly due to the scattered nature of construction site locations, has long been an activity fraught with difficulty.

The introduction and development of computers robust enough to suffer the rigours of site life without loss of performance has greatly eased some of these difficulties, but the industry has, on the whole, been slow to take up the challenge of computerisation implementation for site use, data collection, storage, processing and retrieval.

From the sample it is seen that **only some 51% (56%/21%) use computers at one or more of their construction site locations (see figure 3.6).** This of course indicates that **almost half of all Contractors 49% (44%/79%) do not use computers on site.** The disparity between Contractors and Subcontractors is immediately clear, though perhaps understandable when contrasted with their role on site in the overall scheme of construction management of the project.

Of those Contractors that do use computers on site it was perhaps not surprising to find the priority usage tending towards **word processing, construction programming and cost management** tasks as follows:-

- Word Processing 42%
- Contract Programming 42%
- Cost Management 36%
- Progress Monitoring 35% (*Progress Records*)
- Cost Value Reconciliation 35%

Further down the priority list are the tasks of recording changes and drawings issued:

- Drawing Register 28%
- Instruction Register 27%

**With the least priority being given by Contractors (*some 20%*) to records concerning resources:-**

- Plant Records 21%
- Labour Records 20%
- Material Records 26%

One of the most significant discoveries from the above in the context of the research topic, is that the task of **progress monitoring or progress records was computerised on only 35% of the occasions where computers are used. This would indicate that only some 18%<sup>117</sup> of construction contracts have progress monitored by computer aided methods.** Thus the remainder of contracts are either monitored manually/mechanically or not at all!

As the task of accurately monitoring, tracking and recording progress is essential to the core practice of construction management and later for analysis in the event of an extension of time claim being made, it is clear from the above that much is left to chance.

Thus it is less surprising to recall ( see figure 3.5) that extension of time claims for this sample as a whole were being rejected on the grounds that:

- Cause & effect not demonstrated 35%
- Insufficient support documentation 27%
- Claim too global 20%

On a positive note some 75% of our sample respondents held the view that

---

<sup>117</sup> Calculated as 51% x 35% = 17.85%



"Record Keeping" and "Progress Recording" would be more likely to be improved by the use of computerisation, and even more encouraging was the overwhelming view of the respondents 82% (82%/83%) that the suggestion of periodically maintaining with the Employer an AGREED set of site progress throughout the contract period would improve the settlement of extension of time claims. Table 3.5 sets out an analysis of all the key areas of claims which were deemed capable of improvement by the implementation of computerisation.

It will be seen from the solution proposed later in this thesis that this last item, which will be strongly recommended for implementation, supports a core tenet of the new *CoSTAR* approach, (refer chapter five), ie establishing undisputable facts.

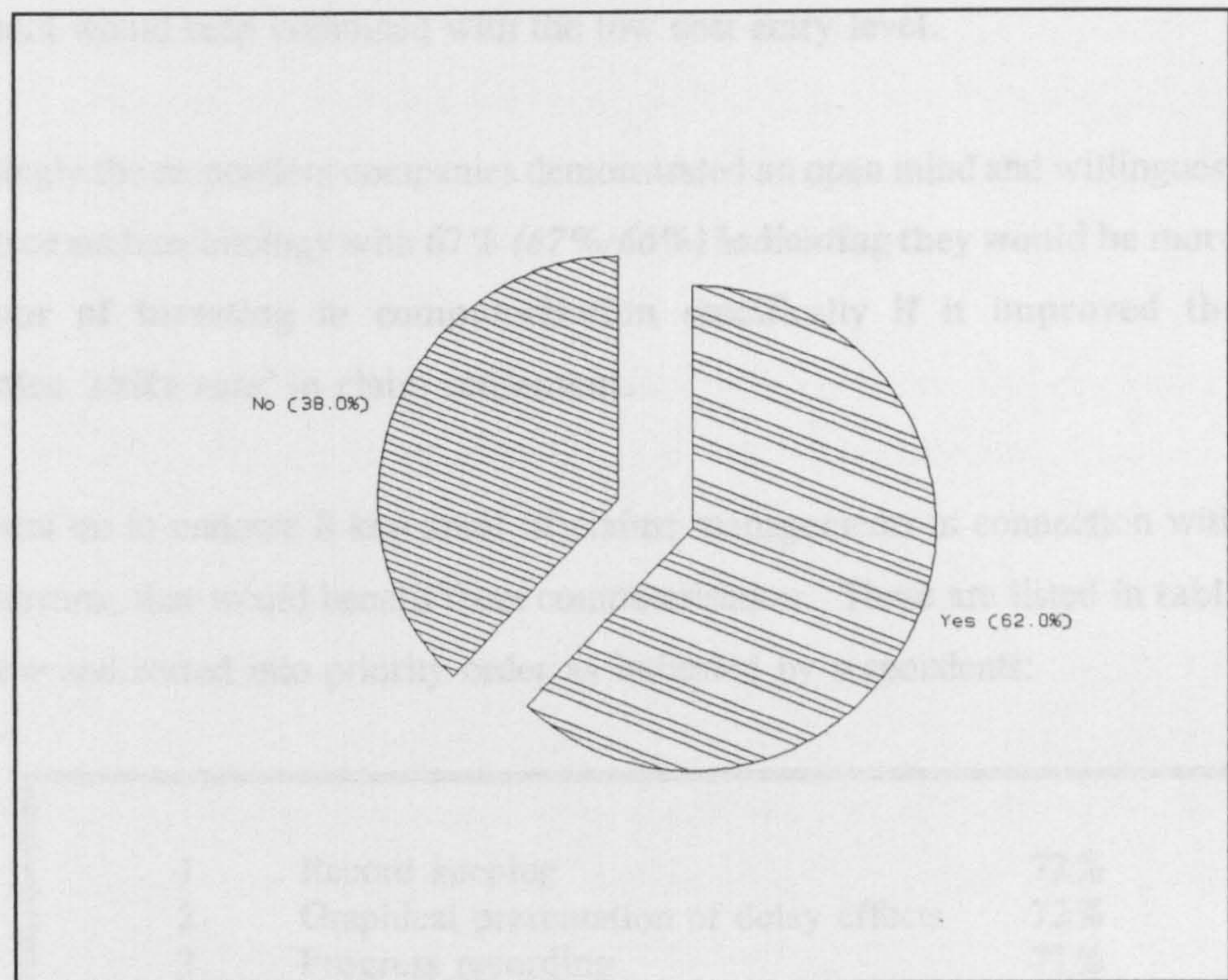


Figure 3.9 Usage of a BS 5750 procedure for managing site documentation

One final point to note is that whilst some 2/3 of Contractors now claim to follow a BS 5750 procedure for handling/maintaining site documentation, this still leaves a significant proportion 38% (35%/52%) who do not. Again a disparity opens up



between the way Contractors and Subcontractors manage their affairs as shown in **figure 3.9**.

#### **3.5.4 Low Investment in Computerisation**

Perhaps the most starkly noticeable finding in response to Question 11 was the discovery that **49% of the respondents (44% Contractors and 79% Subcontractors did not use computers on construction site locations.**(See figure 3.6)

This, all the more curious, when one considers the tangible benefits such investment would reap combined with the low cost entry level.

Interestingly the respondent companies demonstrated an open mind and willingness to embrace such technology with **67% (67%/66%) indicating they would be more in favour of investing in computerisation specifically if it improved the companies 'strike rate' in claim settlement.**

They went on to endorse 8 key areas of claims management, in connection with time overruns, that would benefit from computerisation. These are listed in **table 3.5** below and sorted into priority order as indicated by respondents:

1.	Record keeping	72%
2.	Graphical presentation of delay effects	72%
3.	Progress recording	71%
4.	Computation of costs of delay	69%
5.	Estimating effects of concurrent delays	66%
6.	Forecasting delay estimates	61%
7.	Linking cause and effect	59%
8.	Early notification of delay effects	51%

**Table 3.5 Key areas most likely to be improved by computerisation.**

It is again interesting to note that all of these activities figure largely as main elements in an extension of time claim.

Moving on to the activity of construction planning. It is disappointing to observe (see figure 3.7) that a task so eminently suited to computerisation in virtually every job situation is taken up by only 43% (48%/21%) of the respondents. Of far greater concern is the finding that **32% of Contractors do not use any form of computerisation to prepare their programmes.**

It is readily acknowledged by the writer that preparation of a construction programme using computer technology need be no more sophisticated than preparing a simple bar chart whilst at the other extremity it could comprise a model fully resourced and based upon a tested critical path network. It is therefore contended by the author that construction programmes ought to be prepared somewhere in this range as appropriate to the contract.

On a complex project the programme must reflect this complexity and be capable of being used as a sophisticated management tool. It should be capable of analysis both forward and retrospectively. To assist and enable this form of analysis the technique of '*critical path analysis*' can be deployed, which to be cost effective generally requires computer technology application.

However from the survey it is seen that of the 50% or so of Contractors who regularly use computer generated programmes, **less than half base their programmes on CPA** (see figure 3.5). There is therefore a large segment of the contracting industry at a disadvantage when seeking to employ computer aided analysis to, say, demonstrate causation in delay claims.

The situation seems even more bleak where it appears that only **35% (40%/13%) of Contractors base their extension of time claims on critical path analysis on 50% or more of claim occasions** (see figure 3.4)

### 3.5.5 Costs of Claims Preparation

The very high incident of time overruns on jobs evidenced by the significantly high requirement of respondents to submit extension of time claims (*84% on one or more jobs*) coupled with the low satisfaction rate with the awards made (*83% dissatisfied on one or more occasions*) leads the author to the conclusion that this is a very costly activity, with a large proportion of the burden falling on Contractors, particularly when they fail to justify the validity or otherwise of their claims.

This is further supported by the finding that the claims management or claims settlement process has failed on occasion (*17%*) to such a degree that a dispute has developed and Contractors have been forced to refer the matter to an alternative means of resolution namely arbitration or litigation. A situation that rarely leads to the Contractor receiving a full and true settlement of all his claims, and recovery of all of his costs, both internal and external.

There are substantial sums of money at risk in this area of contracting and whilst **1/5th of Contractors** dedicate individual(s) full time to claims management, **over half of the respondents, 50% (49%/59%), bought in this expertise in the form of specialist consultants.** Figure 3.10 provides a graphic indication of how companies match resources, both internal and external, to claim analysis requirements.

Again this represents a substantial "*below the line*" cost to be borne and hopefully recovered by the Contractor from the project owner.



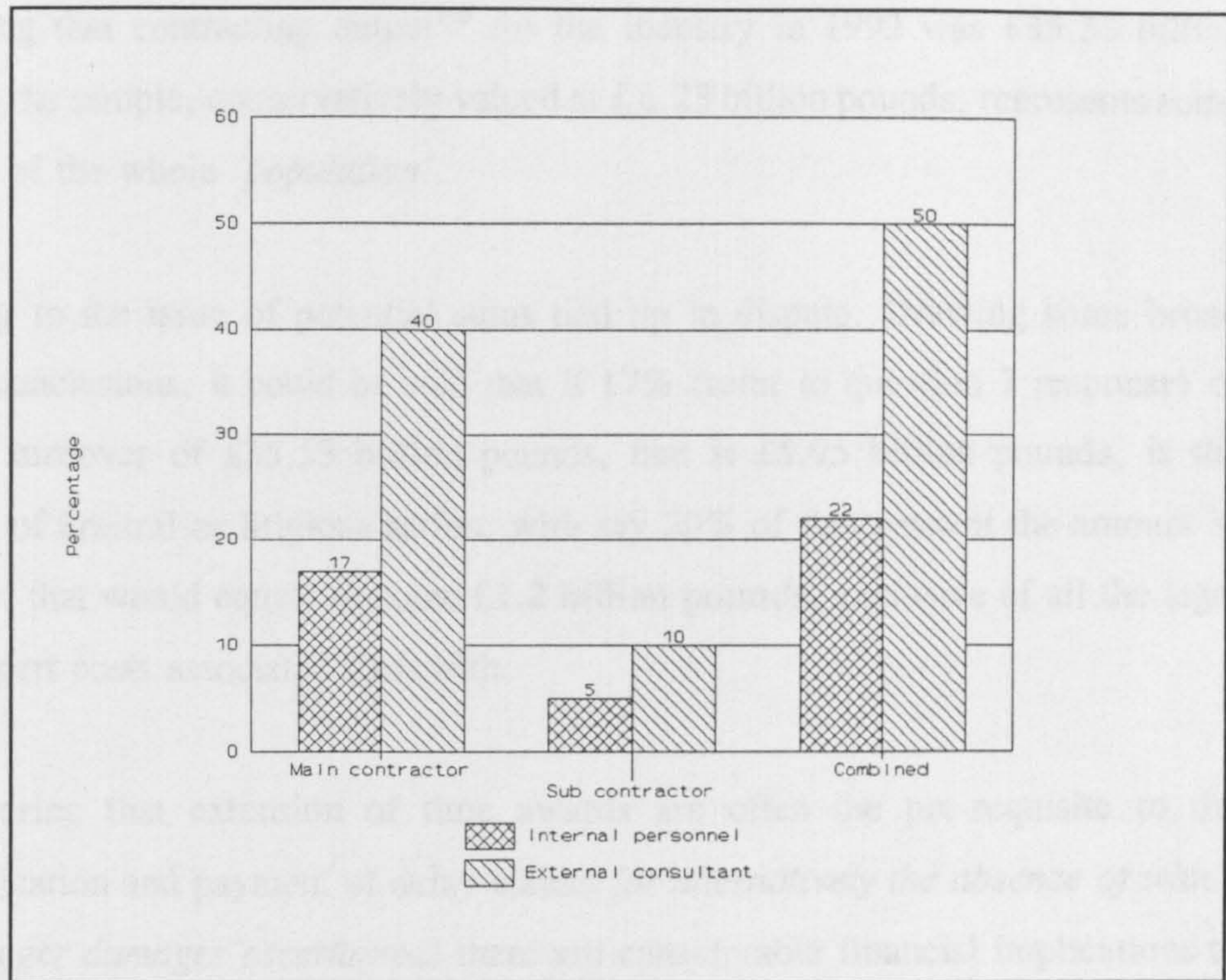


Figure 3.10 Commitment of Contractors resources dedicated to Claims Management.

For the sake of gaining some "feel" for the general scope and nature of the financial implications of the above costs on the construction contracting industry a very conservative estimate was calculated of the likely output or turnover of the survey sample. This is shown in the following table 3.6.

No. of Respondents	Category	£ Millions
44 (£100M plus)	@ say £100M	£4,200M
18 (£50 - £100M)	@ say £50M	£ 900M
113 (£00 - £50M)	@ say £10M	£1,130M
		£6,230M

Table 3.6 Estimate of financial output of sample.



Allowing that contracting output<sup>118</sup> for the industry in 1992 was £35.53 billion pounds the sample, conservatively valued at £ 6.23 billion pounds, represents some 17.5% of the whole 'population'.

Turning to the issue of potential sums tied up in dispute. Drawing some broad brush conclusions, it could be said that if 17% (refer to question 7 response) of annual turnover of £35.53 billion pounds, that is £5.95 billion pounds, is the subject of arbitral or litigious action, with say 20% of that amount the amount in dispute, that would equate to some **£1.2 billion pounds**, exclusive of all the legal and expert costs associated therewith.

Considering that extension of time awards are often the pre-requisite to the quantification and payment of delay claims (*or alternatively the absence of which can trigger damages ascertained*) there are considerable financial implications to the gaining of such.

## **3.6 CONCLUSIONS**

### **3.6.1 Introduction**

This chapter contains the results of an investigation into the process of '*claims management*' as it is currently practised in the live industrial environment, and which was carried out to identify the main problems and/or failings inherent therein.

The review was conducted through a survey of 175 construction contracting firms with a wide spread of turnover and located throughout Great Britain

An approximate calculation of the financial turnover or output of the sample for 1992 was some £6.23 billion pounds representing approximately 17% of the construction industry sector based on CSO information.

The primary data collected totalled in excess of some 3,500 pieces of information which once analysed and interpreted provided a substantial amount of useful information from which deductions and conclusions were drawn.

Sections 3.1 to 3.4 cover the mechanics and detail of data capture and the survey.

Section 3.5 sets out a detailed analysis and interpretation of the survey findings from which conclusions were drawn and which are further briefly reviewed and summarised in section 3.6.3.

### **3.6.2 General Observations**

The high return rate of 50% to the targeted postal questionnaire taken together with the senior ranking<sup>119</sup> of the individuals who took time to complete the form on behalf of their company led to the reasonable conclusion that the topic of research is one of significant interest to the industry.

Whilst the ratio of respondents who defined their principal contracting activity as that of Contractor or Subcontractor was about 5:1 it was clear from the majority of responses that both showed a very close statistical agreement on many of the topics (eg Questions 4, 5, 6, 7, 9, 10, 13, 15, 16 and 18). For this reason the categorisation of Contractor representing the whole sample was used for statistical presentation with the convention adopted of showing in brackets the separate percentage results from the main Contractor and Subcontractor elements accordingly. Where there were marked differences most notably questions 8, 11, 17 and 20, commentary where appropriate was made.

It was observed that the Joint Contracts Tribunal forms of contract are widely used with 90% of the respondent companies indicating they had executed work under one of these forms in the past 2 years, and 70% stating a JCT form governed 1

---

<sup>119</sup> Of 60 individuals who identified their position or job titles on the survey form, approximately half were directors or chairmen, and the other half senior managers/surveyors.

in 2 jobs.

**From this observation it is concluded that there is a high degree of familiarity with the essential elements of these forms and in particular the mechanisms for operating extension of time clauses.**

### **3.6.3 Summary of Major Findings**

Following analyse of the survey data captured, an interpretation of the survey findings, together with deductions and conclusions drawn therefrom is set out in section 3.5.

A summary of the major findings and conclusions is gathered here which will assist in the identification of problems currently besetting claims management as currently practised, and the subsequent formulation of a solution strategy.

With so much data captured the permutations for analysis, classification and presentation of findings are considerable, and any attempt to summarise comprehensively all conclusions is open to error. Accordingly the author sets out below what he considers are the main findings and conclusions reached from analysis of the survey responses.

#### **(1) High incidence of Time Extension claims and subsequent dissatisfaction with awards made.**

Some 84% of the sample had submitted an extension of time claim on more than one occasion on a JCT contract governed job with 32% making a claim as frequently as 1 in 2 jobs.

This finding alone is of limited significance in that there are many justifiable reasons why a project owner or promoter may accept and indeed cause a contract period to become extended.

However, when the high incidence of the claim occurrence is considered against the finding that 83% of the Contractors surveyed were dissatisfied on one or more occasions with the award made in response to a time extension claim submission then a number of conclusions can be drawn.

**Firstly Contractors are failing to analyse and present their claims in a persuadable manner for various reasons, and secondly that Contractors are being held responsible/liable on many occasions for the contract programme delays being caused with the attendant cost implications.**

On this last point it was observed that 17% of the survey had deemed it necessary to commence arbitration or High Court proceedings in the year ending December 1992 on jobs governed by a JCT contract. Whilst the nature of these actions was not specified, statistically the greater number of claims made are for time extensions.

**Thus it is reasonable to conclude that several of these actions referred to arbitration or litigation were either solely or, in part, to deal with time extension claims where Contractors did not accept the responses made to their original claims.**

**(2) Rejected time extension claims**

On the matter of why claims submitted had failed, it was found that 35% of the sample had claims rejected on the grounds that cause and effect of alleged critical delays had not been demonstrated.

20% of the sample had claims rejected because they were "*too global*".

**Taken together these findings lead to the conclusion that Contractors are failing to demonstrate clearly the essential link between the cause and effect of a critical delay.**



**(3) Low usage of computing technology.**

One of the most significant findings of the survey was the discovery that the sample surveyed only 50% made use of computers on their construction sites. It was further discovered that only some 18% of the sample used computers on site for progress monitoring, 10% for maintaining labour, plant, and material records, and approximately 14% for recording instructed changes and registering drawings.

**From the foregoing it is concluded that the greater proportion of Contractors gather and maintain essential project generated data in manual and mechanical systems of which only 66% are disciplined by a BS 5750 type quality system.**

**Further it is reasonable to conclude that by reference to (1) above a time extension claim will be required at some time, which because of the difficulty in gathering the data required for such a claim from manual/mechanically kept site records leads to, and explains the probability of failure or rejection as discussed in (2) above.**

On the specific issue of construction planning it was found that only 51% of the sample prepared their programmes using computing technology for most of their jobs of which only 42 % use critical path techniques. This indicates that only some 20% of the construction industry as a whole employ computer generated programmes which fully logically link all the interdependent activities.

Of those Contractors submitting extension of time claims only some 16% prepared their assessment, using critical path analysis, on every occasion. A further 32% use the techniques occasionally and the remaining 53% submit their time extension claims apparently devoid of any critical path analysis.

**It is concluded that such infrequent use of planning techniques (CPA, CPM, PERT) combined with the low use of computing technology contributes significantly to the failure to properly demonstrate causality in time extension claims, with consequent rejection of claims on this basis, and inappropriate attempts to promote a *global* claim.**

The results of this failure have already been alluded to in (2) above.

#### **(4) Improvement Potential**

**The author concludes that there is widespread failure by Contractors to invest and implement computing technology, and systems to assist in activity essential to effective claims management such as information management and project planning. The survey did however uncover several positive indications leading the author to conclude that there was an awareness, and potential willingness to exploit the benefits that such investment could bring.**

For example **67%** of the survey respondents stated they would be in favour of investing in computerisation to improve their companies "*strike rate*" in claim settlement.

**82%** held the view that the periodic maintenance of an *agreed* set of site progress records collected throughout the course of the contract period would improve the settlement of time extension claims.

Finally respondents to the survey indicated 8 further areas of construction management activity, as set out in section 3.5.4 which would benefit from computerisation, all of which would form key elements in a time extension claim preparation.

#### 3.6.4 The next stage

In this chapter the author observed, based on the survey findings, that the practice of managing claims which is an important part of the whole construction management process, suffers many shortcomings which are resulting in a high degree of claims failure or rejection.

These shortcomings or gaps could be summed up as an identifiable failure to analyse, prepare and present time extension claims in an acceptable format, (using comprehensive advanced planning techniques combined with computing technology), to employers professional teams such that they will be persuaded to award a time extension which matches the Contractors justifiable entitlements. Thus precipitating the formation of disputes requiring resolution possibly through costly arbitration or High Court proceedings.

A secondary, but important, gap is the apparent failure for the industry as a whole to adopt/implement standardised computerised systems for collating and maintaining project generated data records complete with integration links to head office via for example modem communication technology.

In addition there was also identified a failing to employ computing technology more fully in essential areas of project management, namely construction planning, monitoring and controlling with obvious benefits not least being the capability to undertake retrospective time analysis of delay claims.

Having now identified a number of major gaps which expose the failings of the current practical approach to time extension claim preparation the next stage will be to contrast these findings with those of the literature review and form deductions accordingly.





# CHAPTER FOUR

## A REVIEW OF THE PROBLEMATIC ISSUES IN CONSTRUCTION CONTRACT TIME EXTENSION CLAIMS

---

---

- 4.1 Introduction**
  - 4.2 The Problematic Issues**
    - 4.2.1 General
    - 4.2.2 Problematic Issues in Claims Management
    - 4.2.3 Shortcomings in Time Extension Claims
  - 4.3 Deductions**
  - 4.4 Conclusion**
    - 4.4.1 The Gaps
    - 4.4.2 The Next Stage
- 
-

# **A REVIEW OF THE PROBLEMATIC ISSUES IN CONSTRUCTION CONTRACT TIME EXTENSION CLAIMS**

---

---

## **4.1 Introduction**

In chapters two and three the principal problematic issues in the practice of claims management, particularly pertaining to extension of time claims, were identified.

This derived as a result of researching existing professional and technical literature followed by a survey of construction companies in Great Britain.

This chapter will expand and contrast the findings of the above researches, that is the existing and in some instances theoretical knowledge with the harsher realities of success or failure experienced in current practice.

The problematic issues were then further considered in order to isolate by deduction one particular problem for which a solution could be devised, and this in turn led to the formulation of a proposed computer-aided systematic approach to extension of time analysis and assessment for use in the construction industry.

## **4.2 The Problematic Issues**

### **4.2.1 General**

It was stated in the literature review that (construction) claims as defined in paragraph 2.3.3 have become an integral part of the construction procurement

process<sup>120</sup> and are likely to remain so for some considerable time to come<sup>121</sup>

The results of the survey of construction companies supported this statement in identifying that 84% of Contractors had submitted an extension of time claim at some time or other in the last 2 years on contracts governed by a JCT form of Building Contract<sup>122</sup> a form used by over 90% of the respondents at some time or other.

It therefore follows that the management of such claims<sup>123</sup> must also become an intrinsic/integral part of the whole construction management process, and in view of the substantial sums of money and/or risk at stake, must be accorded commensurate priority.

In section 2.3.5 Bramble defined the settlement of construction claims as *"the process of ensuring that the owner pays only a fair price for interfering with the Contractor in the execution of the work"*.

This simplistic view combined with the fact that mechanisms exist and are readily available under the JCT forms of contract to resolve/settle time extension claims arising thereunder contrasts sharply with the findings that over 80% of Contractors in the survey were dissatisfied with the outcome of claims submitted for an extension of time award

Indeed 17% of the sample, during the course of the last year, elected to seek resolution of claims which had deteriorated into disputes, by reference to either arbitration or litigation.

<sup>120</sup> Paragraph 2.3.4

<sup>121</sup> Paragraph 2.4.7

<sup>122</sup> Paragraph 3.5.1

<sup>123</sup> As defined in paragraph 2.3.2

From the literature research the author was able to deduce that there is little mystery/mystique involved in the activity of managing claims to a satisfactory conclusion, however there is clearly considerable room for improving the practicality of the process through the minimisation and/or elimination of some of the more problematic areas.

In the following section the problematic areas as identified in the literature review are contrasted with those found from the Contractors survey, in order to isolate the main failings or difficulties.

#### **4.2.2 Problematic Issues in Claims Management**

Claims and the management of such as defined in section 2.3 obviously covers the whole scope of claim types which can arise during the currency of a construction project.

However one of the most frequent issues forming the subject matter of a claim is critical delay<sup>124</sup> caused to the progress of the contract works. To a great extent this has been borne out, by both the literature and industrial researches.

Therefore as time extension claims are the most frequent, and often seen as pre-requisite to successfully being awarded loss and expense payments, it is the authors view based upon analysis of the above researches that this is the issue most likely to significantly benefit from improvement.

The problematic areas identified in both the literature research and industrial surveys pertaining to time delay claims are listed in **table 4.1** cross referenced to the further detail contained in the relevant chapters.

<sup>124</sup> Hughes/para 2.4.1 (c)(i)...Scott



<b>PROBLEMATIC AREA HEADINGS</b>	<b>LITERATURE REVIEW REFERENCE</b>	<b>INDUSTRIAL SURVEY REFERENCE</b>
<b>Evidence</b> Forensic research, data capture, records	2.4.1 2.5.1	3.5.3
<b>Causation</b> Linking cause with effect, global claims	2.4.2 2.5.2	3.5.2 3.5.1
<b>Proof</b> Material evidence, facts, expert witnesses, Support documentation	2.4.3	
<b>Legal Issues</b> Basis of claim, contract documentation, case law, notices	2.4.6	
<b>Technology</b> Computerisation-usage, investment		3.5.4
<b>Response to Claims</b> Dissatisfaction rate	2.4.5	3.5.1
<b>Costs</b> Unsuccessful claims, specialists, disputes, Increasing frequency of claims	2.4.7	3.5.5
<b>Quantification</b> Damages	2.4.4	
<b>Presentation</b> Negotiation and Settlement	2.4.8 2.4.9	

**Table 4.1 Summary of Analysis of the Main problematic areas in the claims management process identified by the Author**

From the literature review it is clear that a considerable amount has been written on all aspects of processing a claim from initial research, to settlement, including legal and analytical aspects. Indeed there is a tendency for authors and commentators on this topic often to concentrate on the more negative aspects of claims management failure, for example claims evolving into dispute, rather than the proactive claims avoidance and/or settlement processes available.

Once a dispute situation arises then legal factors such as case law, contractual interpretations and higher burdens of proof become central to the resolution process with consequent time and cost implications. Nevertheless, whilst this research project will concentrate on formatting improvements to the claims management process, it is intended that the proposed new system for extension of time analysis and claims preparation, **CoSTAR**, will incorporate legal and contractual requirements necessary to maintain its validity should the claim move from a commercial area to that of arbitration or litigation.

Theoretical knowledge therefore exists to enable the implementation of a partially efficient and effective claims management process. The references and examples which are provided of claims preparation, particularly by quantity surveyor authors, are perhaps not surprisingly, focused more specifically on quantification of damages issues.

However the '*real life*' situation on claims is somewhat different as the results of the industrial review disclosed. All the following issues received a high response rate in the survey: **High frequency of claims, high disappointment levels with awards (extensions of time), increasing costs, low priority rating, little preventative action, increasing arbitration and legal action and damaged commercial relationships.**

### 4.2.3 Shortcomings in Time Extension Claims.

As previously observed (Section 2.6.1.) the most frequent claims are for time extensions, and it is this area upon which this research will now concentrate.

The first 3 problem areas identified in **table 4.1**, namely **Evidence, Causation and Proof**, go to the heart of a claim, in that failure to meet the requirements of these heads is likely to be fatal to any claim, whether on a "*persuasive*" commercial basis or more particularly if measured up against the strict requirements of the legal or arbitral processes.

These areas of difficulty have been expanded and commented upon in **chapter two**, and in **chapter three** were confirmed as areas of claims management practice which were most in need of improvement.

From a more formal perspective, if a claim is incorrectly based then it will certainly fail in the legal/arbitral forum and is likely also to fail in the commercial arena.

Turning to the other major problem, or indeed gap which has been identified and that is the **lack of investment in, and usage of computer technology**. This factor is detrimental to the success of time extension claims in that failing to take advantage of the research and analytical benefits readily available from computing and information technology will mean that most claims of any complexity and substance will lack in providing the essential evidence and proof required to demonstrate the validity of the claim. In addition the failure to employ sophisticated graphical presentation techniques will also hamper a claims likely success, particularly when being presented to respondents with an ever increasing appetite for clarity through communication.

### **4.3 Deductions**

Following the review of existing literature in chapter two, and the analytical findings of the industrial survey in chapter three, a summary of the immediate deductions relating only to these 2 chapters is set out in the following :

- (1) Claims have become an integral part of the construction procurement cycles and are steadily increasing in both number and frequency. This situation is unlikely to change within the foreseeable future.**
- (2) The majority of construction companies executing works under a JCT form of contract are actively engaged in claims preparation and submission for extension of time awards, this being the most frequent head of claim.**
- (3) Claims for time extensions fail to achieve the desired effect for Contractors in the majority of cases.**
- (4) Claims fail through lack of properly prepared and presented evidence sufficient to discharge the burden of proof required for example in terms of contractual/(legal) validity, liability or quantum. This includes the usually fatal flaw in extension of time claims of not clearly demonstrating causality, that is the link between cause and effect.**
- (5) That whilst the techniques of critical path analysis have been available for more than 20 years, made all the more available and "*user friendly*" with the advent of cheap and powerful micro computer technology and which are essential to proving critical time delays, they continue to be omitted**



from the construction management process by a large percentage of construction companies.

- (6) Records, particularly site gathered, which are the core material of any construction claim are low on the list of Contractors priorities for computerising. This particularly impedes researches into causation, drives up the initial costs of such investigations, and leads to sourcing of data problems.
- (7) Claims failure leads to disputes forming, and narrows down the routes of resolution and settlement, usually, to a third party through the processes of ADR, Arbitration or Litigation, all of which require initial expenditures of uncertain costs prior to a conclusion being reached.
- (8) Whilst in literature there are many examples of '*model*' claims processes for time extensions claims, the practical application is considerably less sophisticated and would lend itself to improvement by a co-ordinated systematic approach comprising all the essential stages for claims preparation from initial research through to claim assessment submission.

#### **4.4 Conclusion**

This chapter draws to a conclusion the background research element of the thesis in which the review of literature has been contrasted with industry practice to identify gap(s) in the current methodology of claims management which are leading to failure in extension of time claims.

From the results of the investigations and subsequent deductions, it is clear to

see that there are shortcomings in the current practice which establishes a need for a new or improved approach to the analysis and presentation of extension of time claims by Contractors to improve the effectiveness of the process.

#### **4.4.1 The gaps**

The gaps identified for attention are summarised as follows under a number of group headings:

**Evidence:** Weak document research and data capture methodology.

**Causation:** Failure in identification and analysis of causation including clear demonstration of cause and effect.

**Documentation:** Poor, confused and inadequate document collation and presentation including supporting material evidence.

**Computerisation:** Infrequent use of computer aided critical path techniques.

**Investment:** Low priority investment in resources either human or technological in claims preparation.

**Validity:** Evidence not based on contractual requirements.

#### **4.4.2 The next stage**

**Chapter five** sets out the criteria for an effective assessment system, reflects on the theoretical and practical aspects of the traditional approach, and introduces a proposed approach which combines improvements to the traditional approach with a new systems analysis technique.

## CHAPTER FIVE

### A NEW APPROACH TO COMPUTER-AIDED TIME EXTENSION ANALYSIS AND ASSESSMENT ON CONSTRUCTION PROJECTS

---

---

- 5.1 Introduction
  - 5.2 Criteria for Effective Time Extension Claim Assessment System
    - 5.2.1 Introduction
    - 5.2.2 Criteria Standards
  - 5.3 The Traditional Approach - Theoretical and Practical
    - 5.3.1 The Theoretical Approach
    - 5.3.2 Deficiencies in the Theoretical Approach
    - 5.3.3 The Practical Approach
    - 5.3.4 Deficiencies in the Practical Approach
    - 5.3.5 Summation
  - 5.4 Problem Definition
    - 5.4.1 Introduction
    - 5.4.2 Problem Definition and Description
  - 5.5 Proposed New *CoSTAR* Approach
    - 5.5.1 Introduction to *CoSTAR*
    - 5.5.2 Specification of *CoSTAR*
    - 5.5.3 The four Stages of the *CoSTAR* approach
    - 5.5.4 Implementation of *CoSTAR*
    - 5.5.5 Testing of *CoSTAR* - System Objectives
  - 5.6. Conclusions
- 
-

# A NEW APPROACH TO COMPUTER-AIDED TIME EXTENSION ANALYSIS AND ASSESSMENT ON CONSTRUCTION PROJECTS

---

---

## 5.1 Introduction

The previous chapters, two and three, set out in detail the research findings of problematic issues identified as existent in the process of construction claims management, and the conclusions drawn therefrom, with particular attention being applied to critical delay analysis and time extension claims.

In chapter 4 theoretical knowledge (*identified from the literature review*) and industrial practice (*the survey findings*) were compared and contrasted which resulted in the observation of the main problems which impact upon, and contribute to, the high failure rate of time extension claims.

The main problematic areas discussed were broadly grouped under 3 principal headings namely **Evidence, Causation, and Information Technology**, and were further set out at section 4.3 under deductions (4), (5), and (6). As a result of the aforementioned research and analysis, the problems or shortcomings of the current approaches were defined as gaps and set out under section 4.4.1.

They reflect the principal problematic areas and are used as the basis, combined with research findings from chapters 2 and 3, to form the "*criteria standards*" or "*needs*" of a system which would provide an effective time extension analysis approach.



In order to satisfy the "*criteria standards*" set , and thereby resolve the problems, broad solutions were considered which might bridge the various gaps identified between existing approaches, and other solutions.

Those alternative solutions which could reasonably be identified comprised the following.

- **Solution A** - Retain and amend the current approach as generally used in practice.
- **Solution B** - Adopt and implement the combined theoretical approach.
- **Solution C** - Draft new form(s) of contract which alter the risk ratios as currently exists, and seek changes in legislation which might be required to support this approach.
- **Solution D** - Devise a new approach which embraces the benefits of computer-aided techniques and is designed to meet the performance specification indicated by the criteria standards.

As will be seen from section 5.3 both the existing practical and theoretical approaches were subjected to testing against the criteria standards as referred to earlier. The findings of these tests showed serious deficiencies in the principal areas of the problematic areas identified which would not be addressed fully by ad hoc amendments. Accordingly alternative solutions A and B were rejected.

Solution C would attempt to resolve the problematic issues in such a way as to allocate risk and liability more precisely. It could, for example, do away with potential problems by making one or other of the parties totally liable for time

delays, thereby eradicating the need for time delay analysis or claims at all. It is considered that this approach is remote from the central thrust of this research and does not address the hypothesis as defined. For these reasons this solution has been rejected.

Alternative solution D comprises the design of a bespoke approach which embraces the use of computer-aided technology in the analysis, preparation, and presentation of time delay claims. Being a new approach it has been able to address directly those problems which go to the core of time delay analysis and time extension assessment, and for which the criteria standards had been set as a benchmark.

This solution whilst cognisant of the basic contractual and legal concepts of English Law, primarily seeks to meet the practical requirements of commercially negotiated or non-adversarial dispute resolution procedures.

This new approach, was selected as being the correct one in that it met the requirements of the standards which were set, unlike alternatives A,B and C. The new approach embodies a computer-aided systematic approach to time delay analysis, and is fully described in this chapter. It was tested in a live contract environment, and by expert validation, the results of which are contained in chapters 6 and 7 respectively.

This chapter now takes the reader through the criteria standards devised, the detail contrasting of alternative solutions against same, and finally a full description of the solution selected.

## **5.2 Criteria for Effective Time Extension Claim Assessment System**

### **5.2.1 Introduction**

Contractors seek to make extension of time claims for 2 principal reasons. The first reason is the need to demonstrate that critical delays which have caused a contract period overrun are not their liability, with the cost implications which flow from this premise. Secondly a Contractor requires a degree of certainty with regard to the end date to which he is working and accordingly seeks revisions of same as appropriate in order that he can plan and resequence his resources to match.

An extension of time claim must therefore be prepared so that it satisfies these principal requirements by effectively and efficiently demonstrating to an Employers professional team that an extension of time award is properly due.

### **5.2.2 Criteria Standards**

Based upon the information researched for and gathered in chapters 2 and 3 it is reasonable to deduce that the criteria against which any time extension analysis approach should be measured would incorporate the following requirements:

- (a) **Identification of each causative event** resulting in a critical delay.
- (b) **Provision of material evidence** to support the existence of each causative event.
- (c) **Identification of the critical delay** caused by each causative event.

- (d) **Provision of material evidence** demonstrating the direct link between causative event and critical delay.
- (e) **Analytical capability** to neutralise the effects of Contractors own culpable delaying events.
- (f) **Identification of contractual and/or legal basis** for critical delay claim.
- (g). **Capability of presenting claim assessment findings** in a clear and unambiguous format.

The above list and criteria standards are considered in the following paragraphs when set against the alternative approaches to time extension assessment processes, both theoretical and practical.

### **5.3 The Traditional Approach - Theoretical and Practical**

During the course of this research there has emerged a clear divergence between the "theoretical" and the "practical" aspects of the Traditional Approach. This section contains a description of both aspects of this approach, together with the deficiencies present.

#### **5.3.1 The Theoretical Approach**

The theoretical approach to time delay analysis and assessment is based upon the findings of the literature review as set out in **chapter 2**. It is accordingly an ideal, suggested collectively by the various professional authors and commentators on this topic, and is particularly characterised by repeated emphasis being placed on the importance of effective record keeping.

The following narrative tests the theoretical approach or solution against the criteria standards matched to the various stages of the claim life cycle.



## **(a) Records**

Such records must be accurate, relevant, contemporaneous and detailed sufficiently to record data on the effects of delaying and/or disrupting causative events, including the costs associated therewith. They must in any event be capable of retrieval on a job specific basis to provide substantiating evidence as required.

Typical suggestions included a proposal that the Contractor and supervising consultant on a project should maintain a set of identical records, and further that drawing registers and work change records should be computerised.

Finally on a note of economic practicality, suggestions were made that:

- an optimum economic balance should be struck between keeping insufficient records, and keeping records in minutiae.
- an economically effective level of detail is struck against which progress can be measured.

## **(b) Evidence**

On this topic the theoretical approach strikes an unequivocal chord in its view that material evidence is the means by which the establishment of the existence or non-existence of some fact will be proved to the satisfaction of a court.

The nature of evidence must be understood, identified, defined and if required conform with the Civil Evidence Act 1968. This last covering for example claims being prepared in contemplation of arbitration or litigation.

It was suggested by at least one author that evidence should be accumulated during the currency of the contact period in contemplation that it might be required.

It was also stated that evidence in support of a claim should be fully substantiated and precise, and that in certain circumstances computer generated evidence would be required, for example in demonstrating network analysis findings.

**(c) Delay Analysis**

Emphasis in the delay analysis stage of the claim preparation process was centred on the essential issue of causality, with failure to link cause and effect often proving fatal to a claim.

The following extracts from the literature review findings typify the theoretical approach.

- an acknowledgement that assessing time extension claims is not an exact science, and that the length of any extension can seldom be calculated down to the last day or fraction of a day.
- though the contract programme forms the basis for assessing the progress of a project before a claim is based on such, care must be taken to ensure the programme was both achievable and free of any fundamental flaws.

On the specific subject of time extension claims there is much written on the various theoretical approaches with many examples being given of such claims. Set out below is a distillation of a number of principles expounded.

- Conduct analysis only on networks which will be capable of computing and documenting the causative effect.
- Carefully use restraints at the correct locations of a logically linked sequence of activities to ensure all the linkages are accurate when preparing a case to demonstrate delays.

- If available use a computerised, knowledge based expert system to analyse claim data.
- Concentrate analysis only on delays which occur on critical path(s).
- Undertake a form of CPA (critical path analysis) as far as possible.
- **Prepare an effective CPM schedule with thoughtful and committed utilization of the technique and underlying information.**
- Allow for concurrent delays.
- Allow for delays of the Contractors own making, though it should be noted that Contractor's inefficiencies can arise as a result of interference by an Employer.
- Where liability is unclear, isolate and note. (Reference footnote 60).

**(d) Presentation**

The theoretical approach to claim presentation may be concisely summed up in the following.

The claim should be presented timeously, in a clear, unconfused and uncomplex way, accompanied by fully detailed substantiation. It should include all the evidence required to demonstrate the linkage between cause and effect using whatever chart or diagrammatic format required eg "S" Curves histograms, bar charts etc.

(e) **Legal**

In that a claim may find its way to resolution under the jurisdiction of an arbitrator or judge, the following text reflects this with several references of a contractual and legal perspective.

The legal maxim "*he who asserts must prove*" applies in connection with pursuing a construction claim with the onus of proof resting with the Claimant. This burden extends to the 3 essential ingredients of a claim namely **CAUSATION, LIABILITY and INJURY or (Damages)**.

Building contract claims are a unique combination of law and practice and all contractual claims (including demonstrating causal link) as well as common law claims are founded in law.

Claims assessed and settled under contract (which are equivalent to damages at common law) use common law rules.

There is a body of case law pertaining specifically to construction claims which should be referred to in the course of preparing a claim. Examples of important cases are given in the text of the literature review and listed in the **List of Cases**.

Failure to maintain records in relation to claims in accordance with the terms of the contract may be a breach of same, damaging any prospects of a successful claim.

Global claims should only be made in the last resort.

### **5.3.2 Deficiencies in the Theoretical Approach**

Whilst the theoretical approach is strong in parts, such as the views affirmed in the matter of record keeping, it is just that, a collection of parts. At no stage in the



literature search did the author discover a systematic or standardised approach incorporating all the theoretically held views on the various approaches to time delay analysis claim assessment.

For example there is apparently little written on procedures for gathering data, and converting it into information which an expert planner can use for a delay impact simulation exercise. Indeed there was very little written at all for the British construction industry expounding the theories of using computer-aided critical path methodology for retrospective time delay analysis.

Finally turning to the essential process of managing a construction claim from inception to settlement, again there were few specific references of any substance published in connection with this all important activity, and certainly no definitive works or publications generated specifically for the British market.

### **5.3.3 The Practical Approach**

From the literature review it was observed that time extension claims are arising with increased frequency, and that this is a trend which is likely to continue.

This situation was confirmed by the results of the Contractors survey which found that 84% of Contractors (including Subcontractors) had submitted an extension of time claim on at least one job with some 33% making a claim on every other job.

Thus it is deduced that there is considerable practical experience in approaching this area of claims management, the nature and scope of which is set out below and, again, matched to the various stages of the claim life-cycle format.

#### **(a) Records and (b) Evidence**

Contractors do keep and maintain a considerable quantity of recorded data throughout the currency of a typical contract, however, it is often the prejudicial

**format in which such records are kept, together with difficulties of retrieval for analysis, that results in claims failure on so many occasions.**

The construction industry lacks any formalised system of record keeping and therefore in practice Contractors employ a diverse array of approaches to storing, maintaining and retrieving job specific data. To an extent, the particular information management format will depend upon the size of a Contractor's organisation and the resources it is willing to invest in technology and training. It will thus vary from organisations employing fairly ad hoc manual or mechanical driven procedures, to those using more sophisticated computer-assisted, quality-controlled systems, which for claims work would allow full tracking of data.

The use of computerisation throughout the construction industry is patchy to say the least with the survey indicating that Contractors variously use computers between 20-50% of the time to control the fairly standard data recording in connection with drawings, instructions, work changes, labour, plant and materials records.

**From this it is deduced that for 50% of the time or more the essential data required to be gathered in connection with a claim will require interrogation and processing of manual and/or mechanical record management systems.**

When it comes to providing recorded data in support of a claim, the quality, structure and validity of the documentation is always, wholly dependent on both the methodology of record management as discussed above, and on the skills of the individual responsible for co-ordinating, steering and managing the claim. A further factor being the emphasis, or amount of resources an organisation is determined to commit to this activity. It is thus, like the rest of the "practical approach" a fairly ad hoc affair.

Turning to the specific topic of time extension claims it was observed that only 35% of those organisations **that regularly used computers on site employed them**

to track and monitor works progress.

From this observation it is calculated that only some **18% of Contractors regularly monitor, track and record progress using computer technology**. The implications as to the detrimental effect this has on the collation of data in connection with time overrun claims is commented upon in paragraph 5.3.4.

**(c) Delay Analysis**

Two significant observations are drawn from the Contractors survey which indicate the strength or weakness of the Contractor's approach to time delay analysis.

In the first it was identified that **32% of the sample surveyed never prepared their construction programmes using computer technology**. And of the 68% that did only a further **36% (or 24% of the sample overall)** employed critical path methodology.

**This would strongly suggest that only 24% of Contractors would be in a position to readily demonstrate, with any real substance, the cause and effect of critical delays as they occur throughout the contract period.**

The second observation would tend to corroborate the effect of the first in identifying that where Contractors did submit extension of time claims less than half (48%) were occasionally prepared using critical path analysis (Reference section 3.5.2).

**Thus it is deduced that the practical approach to delay analysis is to employ critical path methodology on less than half the claims.**

**(d) Presentation**

The author relies here on his own views formed from many years of dealing with Contractors claims and would state that in many instances the Contractors approach to presenting a claim is often haphazard and clumsy, perhaps indicating frustration at having to produce such a document, often spoiling the effect of sound analytical work which has gone into the preparation of the claim. In any event there is no industry standard on such presentation techniques and as this topic is not central to the research it is not further pursued.

**(e) Legal**

A general observation on the wider issue of the practical approach to claims management was the finding of apparent readiness by 17% of the survey to pursue settlement through the often costly and time consuming processes of arbitration or litigation.

**5.3.4 Deficiencies in the Practical Approach**

A number of deficiencies (or shortcomings) exist in the practical approach brought about either by factors external to the approach, such as the state of recorded data available, or inherent in the process, for example the methodology employed in delay analysis.

Turning in the first instance to the essential external factor of record management. Failure by Contractors to store, maintain and provide easy retrieval access to job specific data leads to difficulty in identifying critical events for a claim together with the essential evidentiary supporting documentation. This is both time consuming and costly and indeed leads to claim failure as indicated from the survey where 27% of time claims were rejected on the grounds of failure to provide sufficient support documentation.

**A further 20% of Contractors claims were rejected on the basis that they were**



*"global"* in nature and consequently deficient either as to content, and/or supporting documentation.

On the matter of delay analysis procedure it is observed from the survey that some **35% of Contractors fail to satisfactorily demonstrate a link or links between causative events and their critically delaying effects.** The weaknesses in the approach are evidenced by the relatively low usage of computerisation allied to the tried and tested planning analytical technique of CPM (Critical Path Method) as observed previously, which identified that over **50% of Contractors submitted time extension claims where such CPM processes were absent.**

In the instances where computerised retrospective critical path techniques are used, the methodology of application is varied. Many Contractors simply impact delays without regard to the contributory effects of concurrent delays or those of their own making, which result in "theoretical" critical delays totalling many times the actual overrun. This serves to, at best, confirm the thrust of their claim, and, at worst, discredit it in the eyes of the respondent. Indeed one respondent to the survey had a claim summarily dismissed on the grounds that it was "hypothetical".

On other occasions Contractors have attempted to *"blind with science"* the recipient by enclosing overcomplicated *"expert planners"* reports. Alternatively they have attempted to wear down the Employer's team by presenting a monumental quantity of computer data printout. The author has direct experience and thereby examples of both these approaches, neither of which serve a useful claim settlement purpose, but on the contrary reinforce the confrontational approach inherent in modern construction contract procedures.

Deficiencies in the practical approach tend to be amplified in their effect by shortcomings in the assessment capabilities of the recipient. For example, where a respondent receives a well structured, argued, presented and supported claim, the task of assessment is greatly simplified, whereas a poorly drafted, confused, ambiguous and misleading claim either affords the Employer every opportunity to

reject the claim and/or arrive at his own assessment.

The approach of the Employers professional team in arriving at an assessment is, of course, subject to the same strictures and deficiencies of the traditional approach as detailed in the foregoing.

The end result of poor/deficient assessments from both parties being either the abandonment of a claim by the Contractor or the reference for settlement to arbitration or litigation which occurred in 17% of claims as observed from the survey.

### **5.3.5 Summation**

Both aspects of the Traditional Approach, the theoretical and the practical, are strong in parts, highlighting as they do 'the ideal' measured against the 'restrictions and constraints' present in a live project situation. However some important gaps are observed in both aspects of the Traditional approach to the research, analysis and presentation of delay claim assessments which fail to meet the essential criteria standards as detailed in section 5.2.2.

These gaps which comprise both procedural and technological shortcomings are defined further in section 5.4, and will only be addressed by the application of a comprehensive, integrated approach which will ensure the effective coupling of systematically gathered factual data, to computer-aided delay analysis, resulting in the production of a clear unambiguous presentation/statement of assessed critical delay.

## **5.4 Problem Definition**

### **5.4.1 Introduction**

In chapter five, section 5.2 sets out the criteria standards for an effective

extension of time analysis process whilst in section 5.3 the theoretical and practical aspects of the Traditional approach are contrasted identifying deficiencies inherent therein.

In this section a composite problem is defined based upon, and verified as to existence, by the findings of the critical review of the traditional approach to claims management and the deficiencies uncovered accordingly.

#### **5.4.2 Problem Definition and Description**

This research has so far revealed that time extension claims are an intrinsic part of the construction industry and are increasing in frequency. A situation likely to remain unchanged for some time to come.

These factors are symptomatic of the problem, together with the significantly high level (**over 80%**), of claimant Contractors, dissatisfied on more than one occasion with the award made in response to a claim assessment.

The problem is formulated as follows:

*"The failings and shortcomings in the research, analysis, evaluation and assessment of extension of time claims is formulated as a problem whose solution is a new approach which eliminates the deficiencies of the traditional approach."*

The problem is defined under the 2 major heads of failure observed from earlier investigations namely:

##### **(a) Failure on Causation**

Failure to effectively research, analyse, evaluate and present evidence sufficient to discharge the required burden of proof as to causality. That is, in clearly

identifying and demonstrating the link between causative event and resultant critical delay effect.

**(b) Failure on Analytical Methodology**

Failure to employ computer-aided critical path methodology to undertake retrospective analysis combined with omission to devise and employ a technique which could take into account Contractors own and concurrent critical delays.

Contributing external factors to the above specifically defined problem includes **failure by contracting organisations to invest in computing technology equipment and training, and, separately, failure in connection with information management;** for example maintaining efficient and compatible systems of record storage and retrieval.

**5.5 Proposed Solution - A New Approach**

In this section a solution to the defined problem is proposed in the form of a "new approach" to time extension analysis which seeks to address the gaps identified earlier and thereby eliminate the deficiencies or shortcomings of the alternative approaches considered. It is later measured and evaluated against same.

Many of the components of the new approach or process are similar in principle and practice to the traditional approach in terms of data research, analysis, evaluation and presentation of findings in connection with critical delay claim assessments.

The main differences between the proposed and the alternative approaches are as follows. **In the new approach great emphasis is placed on integrating all the various component parts of an assessment process into a system employing computing and information technology.**



From the analytical perspective the new approach specifically addresses the crucial interface between data capture and computer-aided delay impact simulation, which in itself is a significant departure from the traditional methods. The proposed delay impact process also deals with the matter of critical delay of the Contractors own making, and to a lesser degree concurrency of other critical delays.

### **5.5.1 Introduction to CoSTAR**

The solution or new approach takes the form of a **Computer-aided System for Time Analysis Review** abbreviated to **CoSTAR** hereafter for convenience.

**CoSTAR** is a system specification designed and written to satisfy the requirements of an effective approach to the analysis of critical delays and assessment of time extension claims on construction projects.

**CoSTAR** comprises several elements each of which has its own software requirements. The system however does **not** require the need for bespoke or specially written software, or indeed any specific manufacturers software.

It is based on 3 specific types of software namely:

- **Spreadsheet Software** for data capture, database manipulation and all schedules.
- **Project Management Planning Software** used for modelling the original programme, executing the Delay Impact Simulation exercise and identifying and calculating the amount of the critical delays.
- **Word Processing** usual for compiling the claim assessment document.

All of the above should be of a recognised industry standard, and the latest version available.

The actual software and hardware used in the trial implementation is specified in **chapter 6**, some of which would require updating for future use.

### **5.5.2 Specification of CoSTAR**

This proposed system, devised to resolve the problem specified in 5.4, whilst similar to the traditional approach in certain areas such as data research, analysis and presentation, places considerable emphasis on clearly establishing **relevant facts**.

In addition all source documentation upon which calculations, computations, assumptions and deductions are based is sorted and presented in such format that it is capable of, and open to, full inspection and verification.

The **CoSTAR** Technique comprises 4 discrete stages as set out in **table 5.1** and illustrated graphically in a flow chart referenced **figure 5.1**.

**THE FOUR STAGES OF THE *CoSTAR* TECHNIQUE APPROACH.**

**STAGE 1 INVESTIGATION :**

- Data Capture - Delay Identification
- Data Processing - Master Schedule of Delay
- Data Capture - Schedule of Progress

**STAGE 2 ANALYSIS :**

- Coputer Modelled Construction Programme
- Schedule of Delay Impacts
- Logic Listing Report
- Delay Impact Simulation Exercise
- As-Built Record Chart
- Expert Commentary Report

**STAGE 3 EVALUATION**

- Transfer DIS results to Master Delay Schedule
- Descriptive narratives for Critical Delays

**STAGE 4 RESULTS**

- Compile Claim Assessment Report

**Table 5.1 The CoSTAR Approach**

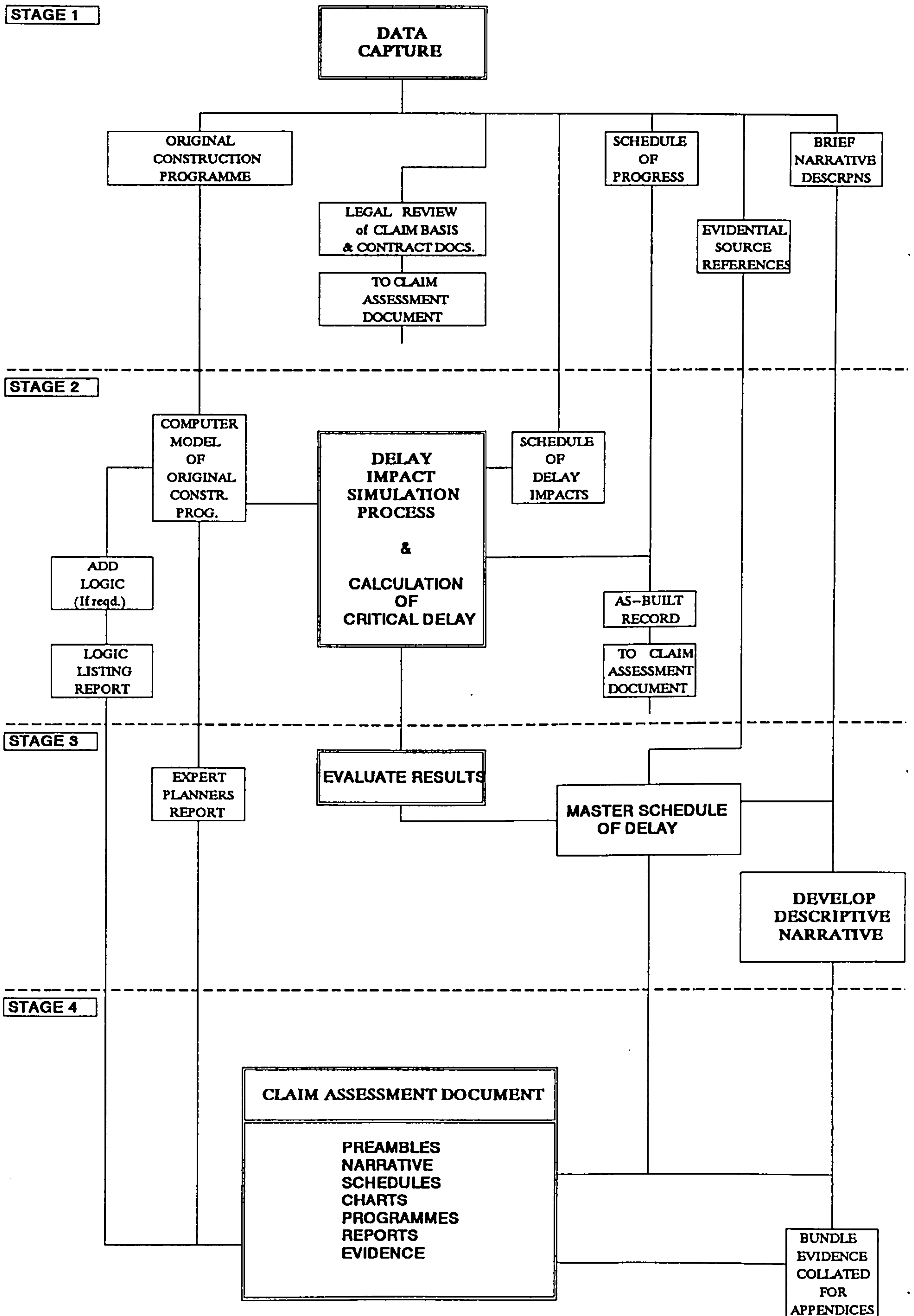


Figure 5.1 Flow chart tracking the the principal stages of the CoSTAR approach.



### 5.5.3 The four stages of the CoSTAR Approach.

In the following text each stage of the new approach is described in detail setting out the steps which comprise each stage. A fully worked example using the technique in a trial implementation is reported in **chapter 6**.

## **STAGE 1 - INVESTIGATION**

This first stage in the approach comprises the very important activity of gathering raw data and information for processing by analysis. The effectiveness of work carried out at this point will have a significant impact upon the validity and accuracy of the claim.

The tasks involved are grouped and detailed as follows:

- **Data Capture**

Data is captured or gathered and recorded on a purpose designed proforma "Data capture sheet" either on a manual "paper basis" or directly into a computer memory. An example of a **CoSTAR Data Capture sheet** is shown in **figure 5.2**.

<b>DATA CAPTURE SHEET</b>	
<i>CoSTAR</i> (Form Co.01)	
<b>JOB TITLE</b>	:
<b>JOB NUMBER</b>	:
<b>CONSULTANT</b>	:
<b>DATE</b>	:
<b>Delay Title</b>	:
Delay Ref No.	:
Delay Start date	:
Delay Finish	:
Date(s) of Written Notices	:
Contract Delay clause(s)	:
<b>CAUSE OF DELAY</b>	(Brief narrative description)
<b>EFFECT OF DELAY</b>	(Brief narrative description)
<b>DELAY IMPACT ON PROGRAMME ACTIVITIES</b>	
<b>SOURCE EVIDENCE</b>	

Figure 5.2 Example of a CoSTAR Data Capture sheet.(Form Co.01)

The principal objective of these sheets is to gather data in an organised and disciplined way often in difficult circumstances where information management is poor, and/or the data sought is complex.

**Only one head of delay is captured per data capture sheet.**

**Before data capture commences, the first task will be to identify all the potential sources of recorded data including for example all relevant contract documentation, construction programmes, job specific data and information, etc., in whatever media it is available. In addition key project staff who may be required to provide essential witness testimony should also be identified and listed.**

Following this exercise a selection must initially be made by the consultant managing or leading the reference, of the relevant sources of data/information which may be available for investigation, often in tandem with preliminary staff interviews in order to identify quickly the potential heads of alleged critical delay.

The data capture process now commences with all essential data being recorded on the proforma sheets to include details of the cause and effect of each delay, particularly by specific reference to the programme, together with full source references.

All completed data capture sheets, together with copies of key support documentation appended (eg. copy of instruction to vary works or draft witness statement), are then collated in readiness for processing.

- **Data Processing**

The collated data sheets are then sorted into chronological order by reference to the date the alleged critical delay took effect. This task would mainly be carried out by the planning expert by reference to the information collected through the data capture process. He will

be seeking to establish the earliest date that the particular event would bite as a delaying effect upon the works. This may on occasion require the planner to form an opinion as to the effective date of delay based upon the circumstances surrounding the causative event if there are gaps in information existent. For example calculating the likely effects of a Contractor receiving later design information.

Specific elements of information are then drawn from the data sheets into tabular landscape format to create the first draft of the **Master Schedule of Delay**.

An example of a **CoSTAR Master Schedule of Delay** (Form Co.02) which forms a key constituent of the final claim assessment document, is shown in **figure 5.3**.



MASTER SCHEDULE OF DELAY						
CoSTAR (Form Co.02)						
JOB TITLE :						
JOB NUMBER :						
Ref. No.	TITLE and CAUSE of DELAY	EFFECT of DELAY	DOCUMENTARY SOURCE References	WRITTEN NOTICE References	CONTRACT CLAUSE References	DELAY TO PROJECT COMPLETION

Copyright P J Keane

Figure 5.3 Example page from the CoSTAR Master Schedule of Delay.

- **Schedule of Progress**

The final step in this stage of the process is the preparation of a **Schedule of Progress** which clearly identifies the commencement, historical progress and completion details of each activity on the construction programme.

The purpose of this schedule is twofold. It firstly plays an essential role in the Delay Impact Simulation (DIS) exercise, and secondly it provides a very useful reference tool both at the data capture stage and later for evaluation purposes.

## **STAGE 2 - ANALYSIS**

This stage is the core of the whole process and is the point at which the new approach using the **CoSTAR** technique departs most significantly from the traditional approach. It requires the addition of skills to the review team in the format of an individual who is expert and experienced in project management software and construction planning techniques.

The requisite elements of the **system specification** are detailed in the following:

- **Computer modelled construction programme**

Taking the Contractors original construction programme, valid at commencement of the works, the expert planner creates a model of same, using project management software for use in the **Delay Impact Simulation** exercise.

It is essential that the model programme is based as a logically linked network which represents and demonstrates the interdependence of construction activities. If the original

programme does not have a logic prepared by the Contractor then the expert planner will be required to devise and impose a logic of his own which will be declared as such in his expert commentary.

Where a network has been supplied, this will be reviewed by the expert planner to examine for flaws or inconsistencies. Again should any mistakes be uncovered which would seriously affect or distort the actual calculation of the network, they would have to be rectified, and this will be fully reported in the experts commentary.

It is essential that the original Contractors intent in the form of his construction programme is left unaltered, ie not "improved" upon in any way other than as described above.

- **Schedule of Delay Impacts**

This schedule is formed from data collected during stage one. It essentially "*translates*" relevant data concerning the critical effects of a causative event into planning technique constraints which will be used in the **Delay Impact Simulation** exercise.

In format, as can be seen from **figure 5.4**, the schedule comprises a listing of the alleged critical delays, the construction programme activities affected, and the interpretation of the effect from evidential narrative to logic link restraint.

This is perhaps the most sensitive and important task of the whole computer-aided analysis process, building as it does on data painstakingly collected, and then forming the central mechanism to the **CoSTAR** technique simulation approach.

Indeed the latter process, though requiring careful execution, is

largely a mechanical affair relying 100% on the data/information being provided by the twin schedules of "Delay Impacts" and "Progress".



<p style="text-align: center;"><b>SCHEDULE OF DELAY IMPACTS</b>  <i>CoSTAR</i> (Form Co.03)</p>				
<p><b>JOB TITLE</b>                   :</p> <p><b>JOB NUMBER</b>               :</p>				
Ref No.	Delay Title	Activities Directly Affected	Constraint D/S,D/F	Period and/or Date

**Figure 5.4**            **Example of CoSTAR Schedule of Delay Impact sheets.**  
**(Form Co.03)**

- **Logic Listing Report**

In order to promote the concept that the approach is fully open to scrutiny, and indeed assist an Employers professional team in carrying out exactly the same analysis, a logic listing of the Contractors base programme is provided in the final assessment report submission together with a computer disk containing the model programme. An example of a **CoSTAR** Logic Listing Report sheet (Form Co.05) is shown at **figure 5.5**.

<p style="text-align: center;"><b>LOGIC LISTING REPORT</b></p> <p><i>CoSTAR</i> (Form Co.05)</p>		
<p><b>JOB TITLE :</b></p> <p><b>JOB NUMBER :</b></p> <p><b>CONSTRUCTION PROGRAMME REFERENCE :</b></p>		
Ref No.	Programme Activity	Interdependent Logic Link

Figure 5.5 Example of a CoSTAR Logic Listing Report sheet. (Form Co.05)

- **Delay Impact Simulation**

The emphasis in the process now moves firmly to the capabilities of the computing technology employed.

For the purposes of this research it is stated that computing hardware and software does not form part of the topic, and will not be referred to further save only to comment that the **CoSTAR** technique approach was developed on, and for, readily available industry standard software, and personal computer type machines. Details of the actual equipment used in the trial run are contained in section 6.2.2.

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 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 simulation exercise itself comprises of 6 main steps:

- (1) **Input from the Schedule of Progress**, the latest progress of the works for the project up to a date **just prior** to an alleged causative event. (See **figure 5.6** for an example of a **CoSTAR Schedule of Progress**).



- (2) **Command** the computer to run a critical path analysis calculation on the model.
- (3) **Impact** the interpreted effect of that delay (from the **Schedule of Delay Impacts**) in the form of activity constraints.
- (4) **Command** the computer to run a critical path analysis calculation on the model.
- (5) **Observe and record** the results of the calculation which will show the end date, or completion date of the project moving backwards, forwards, or staying the same. The results, to include the time quantum, should be transferred to the **Master Schedule of Delay**.
- (6) Save a "*Snapshot*" of the model in its current state to a computer file, and the whole process is repeated until the **Schedule of Delay Impacts** is exhausted.

It is important to note that each causative event is **treated separately and in a chronological sequence**.

A fully worked example of the above process is contained in Section 6.3.2.

SCHEDULE OF PROGRESS											
<i>CoSTAR</i> (Form Co.04)											
JOB TITLE :											
JOB NUMBER :											
Construction Programme Activity		JOB TIMESCALE (Week nos. or dates)									
Ref No	Title	1	2	3	4	5	6	7	8	9	10

Figure 5.6 Example of a CoSTAR Schedule of Progress sheet. (Form Co.04)

- **"As Built" Record**

Using data supplied in the **Schedule of Progress** the expert planner prepares a computer based "*as built*" record of the historical progress on the works to be generated as hard copy in the form of a bar chart.

This is a very useful tool in providing an opportunity to visually check quickly the actual performance of any construction activity, and in particular to assist the recipient when reviewing the claim assessment.

It also provides an opportunity to review visually the pattern of activities in the actual overrun period which may be used for verification checks.

- **Expert Commentary Report**

This is an important report from the perspective of scrutinising and checking the validity of the claim assessment.

It should comprise of:

- a review of the Contractors construction planning.
- any comments upon the base programme used for the model.
- a brief explanation of the CoSTAR technique and the computing equipment and software used.
- any other relevant comments.

This section should also contain a copy of the model programme saved on a computer diskette.

## STAGE THREE - EVALUATION

This penultimate stage essentially comprises an evaluation of the results of the **Delay Impact Simulation** analysis which will have identified those causative events calculated to have directly contributed to the critical delay.

Once satisfied that the exercise has not thrown up any bizarre or obviously flawed results the **Master Schedule of Delay** is completed with the addition of the actual time overrun period being shown against each critical head of delay.

Following this, the essential details pertaining to each head of critical delay can be enlarged in scope into the format of a **full descriptive narrative** text cross referenced to a bundle of copy support documentation collated for this purpose.

## STAGE FOUR - RESULTS REPORT

This final stage is no less important than the other stages in that the results forming the core of the claim assessment submission must be communicated effectively and crisply to the claim recipient in as *"user friendly"* a format as possible.

Particular attention must be paid to ensuring that all documentation which clarifies and allows proper inspection of the **CoSTAR Data Impact Simulation** exercise is either appended to the document or made readily available for easy access.

The structure and layout of the claim assessment submission may follow traditional technical/management report style format which should include:

- **Preambles**

Following the title page and contents, an abstract or summary of the claim assessment, executive summary for lay readers (optional),



brief project details, guide to the document and a concise section on the legal and contractual basis of the claim.

- **Text**

Descriptive narrative of critical delay causes and effects cross referenced to supporting/corroborating evidential documentation.

- **Schedules**

Master Schedule of Delay  
Schedules of Progress  
Schedule of Delay Impacts

- **Charts and Programmes**

Original construction programme (in original format).

Original construction programme reproduced from computer generated model.

Revision issues of construction programme.

As built representation in bar chart format.

- **Reports**

Expert planner commentary  
Logic listing report

- **Evidence**

Copied bundles of supporting documentation sorted and appended to allow full cross reference with 'Narrative Descriptions' and 'Master Schedule of Delay'.

This concludes the specification of the **CoSTAR** process. A full trial of the approach, complete with explanatory examples, is contained in **chapter 6**.

#### **5.5.4 Implementation of CoSTAR**

As previously stated in Section 5.5.1 many of the components of the new approach, *CoSTAR*, are similar in certain aspects to the traditional approach.

Thus a core of the technical and managerial skills required to implement the process is likely to be readily available in house in many organisations, with resource needs probably commensurate with the size, nature, and complexity of claim analysis requirements likely to arise.

It is nonetheless considered that requirements necessary for the new approach would include:

##### **1. Record Management**

Record keeping to be codified in a systemised format, ideally computerised, but in any event in such a way as to allow efficient interrogation and retrieval of information or data.

##### **2. Data Capture**

A data gathering system which may be used to control, manage and impose a disciplined approach at the investigatory stage.

### **3. Computing Technology**

An integrated package of software providing project management, database, spreadsheet and word processing functions. In addition computing hardware of adequate specification to effectively run the aforementioned software.

### **4. Commercial Skills**

Commercial skill and experience capability to understand and identify the claims contractual implications in terms of notice requirements, contract clause reliefs etc, together with the basic essentials of evidentiary matters.

### **5. Expert Skills**

Expert skill and experience capability to undertake initial forensic research including staff interviewing.

Expert planning and or project management skill required to convert raw data into information, undertake analysis work and report results.

It is envisaged that the new approach will comprise a fully integrated, interactive computer based system, complete with appropriate checks and balances.

It is proposed that data captured through portable lap top or notebook machines on location is stored on a central database where it would be used for analysis, formation of schedules and publication of assessment submission.

#### **5.5.5 Testing of CoSTAR**

To test the system it was decided to conduct a trial run of CoSTAR under live project conditions. The criteria standards set out in Section 5.2 were converted into a list of **system objectives** against which the system was tested.

These system objectives are specific, essential to the integrity of the new approach and are set out in the following:

The new approach must:

- (1) **IDENTIFY** each causative event which has affected or contributed to an alleged critical delay.

(For inclusion in the *Master Schedule of Delay*)

- (2) **IDENTIFY** and **SCHEDULE** the essential source material evidence pertaining to each causative event.

(For inclusion in the *Master Schedule of Delay* and for use in collation of supporting documentary bundles appended to claim assessment submission)

- (3) **IDENTIFY** and **SCHEDULE** historic progress of the works for each programmed activity.

(For inclusion in the *Schedule of Progress*)

- (4) **IDENTIFY** and tag each causative event with the contractual/legal basis of the claim.

(For inclusion in the *Master Schedule of Delay*)

- (5) **CONSTRUCT** a computer based model of the original construction programme with all the interdependent activities fully logically linked.

(For use in the *Delay Impact Simulation* process)

- (6) **INTERPRET** the scheduled causative events in terms of localised construction programme constraints.

(For inclusion in the *Schedule of Delay Impacts*)

- (7) **CALCULATE** the critical delay effect of each alleged causative event



resulting from the *Delay Impact Simulation* exercise.

(For inclusion in the *Master Schedule of Delay*)

- (8) **CONSTRUCT** an *As-Built* record tracking the historic progress of the works.

(For inclusion in the *Claim Assessment Submission*)

- (9) **DESCRIBE** in narrative format full particulars of each causative event of a critical delay, cross-referenced to the *Master Schedule of Delay*, the appended *Bundle of Documentary Evidence*, and any other relevant source.

(For inclusion in the *Claim Assessment Submission*)

- (10) **COLLATE** the analysis results and supporting evidence into a report style format to include:- introductory preambles, narrative text, schedules, charts, programmes, reports and copied documents.

(For inclusion in the *Claim Assessment Submission*)

The full CoSTAR approach was tested in a two fold manner. In the first instance the process was tested in a "*live contract*" situation, the results of which are reported in chapter 6.

In the second instance a panel of experts was selected, on the basis of their qualifications and experience in this particular area of construction management, to critically review the new approach against the system objectives set out in the foregoing and judge whether in their opinion CoSTAR could achieve them.

## 5.6 Conclusions

This chapter considered the theoretical and practical aspects of the traditional approach, the deficiencies inherent therein, and defined such shortcomings as a problem which clearly demonstrated the need for a new, amended or revised

approach.

Also in this chapter a set of criteria standards was devised which would satisfy the requirements of an effective retrospective critical delay analysis system. These were later converted into a set of system objectives against which a new approach was tested.

A solution was proposed in the form of a "*computer-aided system for time analysis review*", abbreviated to **CoSTAR**, which was then fully described.

This systemised and automated approach to assessment, based on research, analysis and evaluation of job specific performance data, will be of considerable benefit to both claimants and recipients for conducting retrospective critical delay analysis, and indeed also as a risk analysis forecasting tool or model.

It may also be employed during the currency of a contract to isolate and evaluate discrete causes of critical delay.

In summary the author concludes that the **CoSTAR** approach comprises the essential features for effectively demonstrating causation, liability and damage in connection with critical delays resulting in contract period overruns. More specifically this approach leads to claim assessments being **evidentially factually based, capable of data source audit and inspection, and with all analytical and evaluation computations fully capable of easy checking and verification.**

All of the foregoing is targeted to meeting the requirements for settlement of claims by commercial negotiation and agreement. However the format and structure of the approach is such that the evidence prepared will fit the requirements of resolution under the jurisdiction of an arbitral or litigious process.

In chapter 6 the findings of a trial run or implementation of the **CoSTAR** approach in a live construction project situation is reported upon.

---





# TRIAL IMPLEMENTATION OF THE PROPOSED NEW *CoSTAR* APPROACH

---

---

## 6.1 Introduction

Chapter five set out and described in detail an integrated, computer-aided, systematic approach, *CoSTAR*, conceived, designed and developed to be sufficiently precise and reliable such that it would satisfy the research hypothesis as set out in chapter one :

*"If a computer-aided systematic approach is used to gather, model, analyse and evaluate project specific performance data, it will provide an improved and reliable basis for assessing the critical effect(s) of interference in a Contractors progress of construction works, and will identify essential evidence pertaining to the critical delay(s)."*

The objective being to improve effectively the accurate analysis and preparation of Contractor's time extension claims, which in turn would lead to an increase in the positive recognition and award of extensions of time.

This would provide the further benefits of earlier assessment and release of cash entitlements in connection with such claims, and ultimately result in a reduction in the numbers of straightforward commercial claims which, through failure to settle, evolve into (*commercially*) damaging disputes which consequently delay settlement and require reference to costly resolution procedures in the form of arbitration or litigation.

In order to assess whether the new approach - **CoSTAR** (*which combines traditional techniques with those more experimental in design*) would work effectively it was necessary to test and validate the system.

The assessment was in two parts. The first, managed and controlled by the author, comprised a trial run in a 'real life' situation, the results of which were analysed, evaluated and are commented upon in this chapter, together with a description of the procedures and controls employed.

The second part of the assessment took the form of a validation process conducted through an experts review, and which is reported in **chapter seven**.

The test data for the trial run was supplied by a major international construction and property group, and test facilities/resources were provided by a leading international construction consultancy group who specialise in construction contract problems, claims and dispute resolution. The test data was used in its unedited format, and was not subject to any selectivity by the author. For reasons of confidentiality the names of both companies, the project and all other persons or bodies involved will not be identified in this thesis.

The trial run of **CoSTAR** is illustrated in detail complete with tables, figures and charts, and the processes of collecting, sorting, analysing and processing data is fully described, in particular the expert planning methodology employed during the essential **Delay Impact Simulation** exercise.

As previously stated this new integrated approach is experimental in design and thus results obtained were analysed to identify not only the degree of success achieved, but, perhaps equally as important, flaws and/or limitations present in the system.

It should be noted that whilst this approach or system may be used for alternative functions, for example risk assessment or preventative action, throughout the trial

run the approach was used solely for the purpose of undertaking historic retrospective analysis of a contract period overrun to identify the causative events, and quantify their effects in compliance with the central research objective as previously set out.

## 6.2 Procedure and Methodology

### 6.2.1 Tasks Undertaken

The **CoSTAR** approach, which comprises four distinct stages, (reference section 5.5.2) was put to a full trial test run, on a live project, and is briefly described later in this chapter.

As described in **chapter five** the 10 system objectives which the new approach had to satisfy were as follows:

<b>PROPOSED <i>CoSTAR</i> APPROACH SYSTEM OBJECTIVES</b>	
<b>No.</b>	<b>OBJECTIVE</b>
1.	<p><b>IDENTIFY</b> each causative event which has affected or contributed to an alleged delay.</p> <p>Each event will be recorded on a separate <i>Data Capture Sheet</i>, and later transferred to a <i>Master Schedule of Delay</i>.</p>
2.	<p><b>IDENTIFY</b> and <b>SCHEDULE</b> the essential source material evidence pertaining to each causative event.</p> <p>The references for each source will be recorded on a separate <i>Data Capture Sheet</i>, and later transferred to a <i>Master Schedule of Delay</i>.</p>
3.	<p><b>IDENTIFY</b> and <b>SCHEDULE</b> historic progress of the works for each programmed activity.</p> <p>This information will be recorded in a <i>Schedule of Progress</i> for use in analysis stage of the process, and also for constructing an <i>As Built Programme</i>.</p>

4.	<p><b>IDENTIFY</b> and <b>TAG</b> each causative event with the contractual/legal basis of the claim.</p> <p>This information will be entered in an appropriate column in the <i>Master Schedule of Delay</i>.</p>
5.	<p><b>CONSTRUCT</b> a computer based model of the original construction programme with all the interdependent activities fully logically linked.</p> <p>This will be effected using approved standard project planning software. The computer files containing the information will be capable of close scrutiny to check the accuracy of both the model, and the underlying logic supporting the network of activity links.</p>
6.	<p><b>INTERPRET</b> the scheduled causative events in terms of localised construction programme constraints.</p> <p>This information will be used to prepare a <i>Schedule of Delay Impacts</i>. for use during the analysis stage.</p>
7.	<p><b>CALCULATE</b> the critical delay effect of each alleged causative event resulting from the DELAY IMPACT SIMULATION exercise.</p> <p>The result of each calculation will be recorded in an appropriate column in the <i>Master Schedule of Delay</i>.</p>
8.	<p><b>CONSTRUCT</b> an <i>As-Built</i> record tracking the historic progress of the works.</p> <p>This will take the form of a <i>Construction Programme Chart</i> which can take many forms, but usually as a bar chart, and which will clearly show the progress of each and every activity relevant to the analysis requirements.</p>
9.	<p><b>DESCRIBE</b> in narrative format full particulars of each causative event of a critical delay, cross-referenced to the Master Schedule of Delay, the appended Bundle of Documentary Evidence, and any other relevant source.</p> <p>All such data will take the form of separate <i>Text Reports</i> which will be bound in with the full claim submission.</p>
10.	<p><b>COLLATE</b> the analysis results and supporting evidence into a report style format to include :-</p> <p style="padding-left: 40px;"><i>introductory preambles, narrative text, schedules, charts, programmes, reports, and copied documents.</i></p> <p>The above would be bound into one or more documents and comprise the total <i>Claim Submission Document</i>.</p>

Table 6.1 The CoSTAR Approach System Objectives

In order to implement these objectives a series of WORKING PROCEDURES was formulated and which is set out in the following table.



**WORKING PROCEDURES NECESSARY FOR THE  
IMPLEMENTATION OF THE CoSTAR APPROACH**

- (1) **Selection and identification of controls** (*described further in 6.2.2*).
- (2) **Selection and identification of source material evidence** (*eg documentation, other multi media verbal*).
- (3) **Formulation of master claim management strategy.** That is matching the CoSTAR Technique with the sources and resources available to ensure the Contractors principal objective is met (*ie the analysis and preparation of an extension of time claim sufficiently persuasive to trigger a positive, proper, and timeous time extension award*).
- (4) **Appointment of investigation team for data capture.** (*Individuals selected for this work should be experienced and qualified professionals in the practice of construction management, and knowledgable in the area of contract law and evidence.*)
- (5) **Appointment of expert planner.** (*It would be expected that this individual would have substantial experience in the use of project planning systems and techniques, including computerised systems, and also a good understanding of construction practise.*)
- (6) **Data capture and initial processing.** The latter to comprise preparation of draft schedules of Critical Delay, Progress and Delay Impacts.
- (7) **Delay impact simulation and critical delay computation** using the schedule of delay impacts, schedule of progress and the computer based contract programme model.
- (8) **Finalise Master Schedule of critical delay.**
- (9) **Draft/compile descriptive narrative of each critical delay.**
- (10) **Compile, edit and finalise completed claim assessment submission** to include introductory preambles, legal/contractual commentary, planning expert commentary, descriptive narrative, master schedule of critical delay, all supporting schedules, charts, tables illustrates and evidence as gathered which directly supporting the subject matter of the claim.

Table 6.2 Working Procedures

### 6.2.2 Selection and identification of controls

Neither the computer hardware nor software used in the trial were experimental in nature and did not form part of the test or trial. Both were in fact widely used 'industry standard', which are readily available 'over the counter' at reasonable cost, and are specified in the following. The origin and content of source data is also described.

#### (a) The Hardware

The hardware specification used for the planning analysis work is set out in **table 6.3**

<b>Description</b>	<b>Computer</b>
Machine	Personal Computer
Make	Compaq
Model	Deskpro
Processor	286
Memory	20 MB
Screen	14" SVGA Colour

**Table 6.3 Computing Hardware specification for planning analysis work**

#### (b)The Software

The software specification used for all stages during the trial run is set out in **table 6.4**

Function	Software	Version
Operating System	MS DOS	3.3
Word Processing	Wordperfect	5.0
Spreadsheet	Lotus 123	2.3
Project Planning	Pertmaster Advance	2.4

**Table 6.4** Software specification for analysis work.

**(c)Source Documentary Data**

The source documentary data supplied by the Contractor for initial investigation comprised official paperwork in the form of contract documentation, correspondence, meeting notes, drawings, contract planning programmes registers etc, together with contemporaneously made records relating to information flow, instructions, changes, costs and resources.

With the exception of the Contractors own internal correspondence and memorandum (including that with domestic Subcontractors and suppliers) and various other internal records relating to deployment of resources, the remainder, indeed the bulk, of evidential data relating to the progress of the works and associated issues was in the possession and domain of both the Contractor and the Employer (ie both parties to the head contract).

As such this latter type of data is verifiable as to factual existence, and as such does not form part of this trial.

In summary the above controls were either widely accepted tried and tested items of technology, or in the case of source data, legally valid and accepted methods of recording and storing contemporaneous data within the construction industry.

### 6.3 Trial Run of the Proposed Approach - CoSTAR

As stated in chapter five, the proposed approach CoSTAR (or Computer-aided System for Time Analysis Review) comprises 4 discrete stages as set out in the following listing which will be used as the logical format for describing the trial implementation.

<b>The <i>CoSTAR</i> Approach</b>	
<b>STAGE 1</b>	<b>INVESTIGATION</b> Data capture and initial processing into draft schedule.
<b>STAGE 2</b>	<b>ANALYSIS</b> Delay impact simulation and critical delay computation.
<b>STAGE 3</b>	<b>EVALUATION</b> Master schedule of critical delay with descriptive narrative.
<b>STAGE 4</b>	<b>RESULTS</b> Compilation of final claim assessment.

Table 6.5 The CoSTAR Approach

The construction project selected for the trial run comprised the total shell and core renovation of a 1930's, 6 storey office, exhibition and research establishment, with the addition of a new floor at roof level, the bulk of mechanical air handling plant to be sited on the roof and whole facade to be retained and refurbished.

The building is located on a busy inner city centre site and the Contractor was confined to working within the "footprint" of the existing building save only that overhead gantries were allowed above, pedestrian footpaths, to one side, and to the rear of the building. All materials and plant had to be stored either on site, or at a location some distance away from the works.



The contract form was bespoke in nature though similar in content to the array of standard forms, currently published, and the approximate contract sum was £35 million.

Turning to factors of a timeous nature, the pertinent ones are as follows:-

**Original contract period :** 78 weeks  
**Actual contract period :** 106.4 weeks  
**Overrun to original contract period :** 28.4 weeks (36%)

Construction planning programmes were drafted and issued in the versions and format as set out in table 6.6, though not all were issued to the employer.

<b>Date Issued or Time Now</b>	<b>Reference</b>	<b>Period Covered (Weeks)</b>	<b>Comment</b>
19.03.90	CP/101	1 to 78	Original construction programme. No of activities: 448
03.02.91	CP/101/A CP/101/B	45 to 90	Not issued. No of activities: 676
14.01.91	CP/101/C CP/101/E	81 to 116	Not issued. No of activities: 836

**Table 6.6 Construction programme versions**

In summary then the situation prior to the implementation of the CoSTAR Technique approach was as follows. The Contractor had issued in total 3 versions of the construction programme, that is the original and 2 updated revisions. The factual overrun to the works over the originally contracted construction period was 28.4 weeks, the whole of which the Contractor was alleging had been caused directly by employer interference in one form or another.

The employer held a different view, and despite 2 submissions by the Contractor

during the currency of the works, had only been persuaded that the employer had liability for **1.4 weeks**. This approximating to some **5% of the actual time overrun**.

The Contractor's **principal objective** was to **provide the employer with evidence sufficiently persuadable such that a reasonable extension of time award would be made**, thus avoiding the only formal dispute resolution method available under this contract being evoked, namely litigation through High Court proceedings. The Contractor's principal objective was to be achieved in the shortest time possible.

The implementation of the trial system commenced shortly after the expiry of the originally contracted construction period of **78.6 weeks**. In view of the fact that a major revision to the construction programme was issued a little over half way through the original contract period, it was decided to sub-divide the analysis and presentation of the Contractors assessment into 3 parts as illustrated in figure 6.1

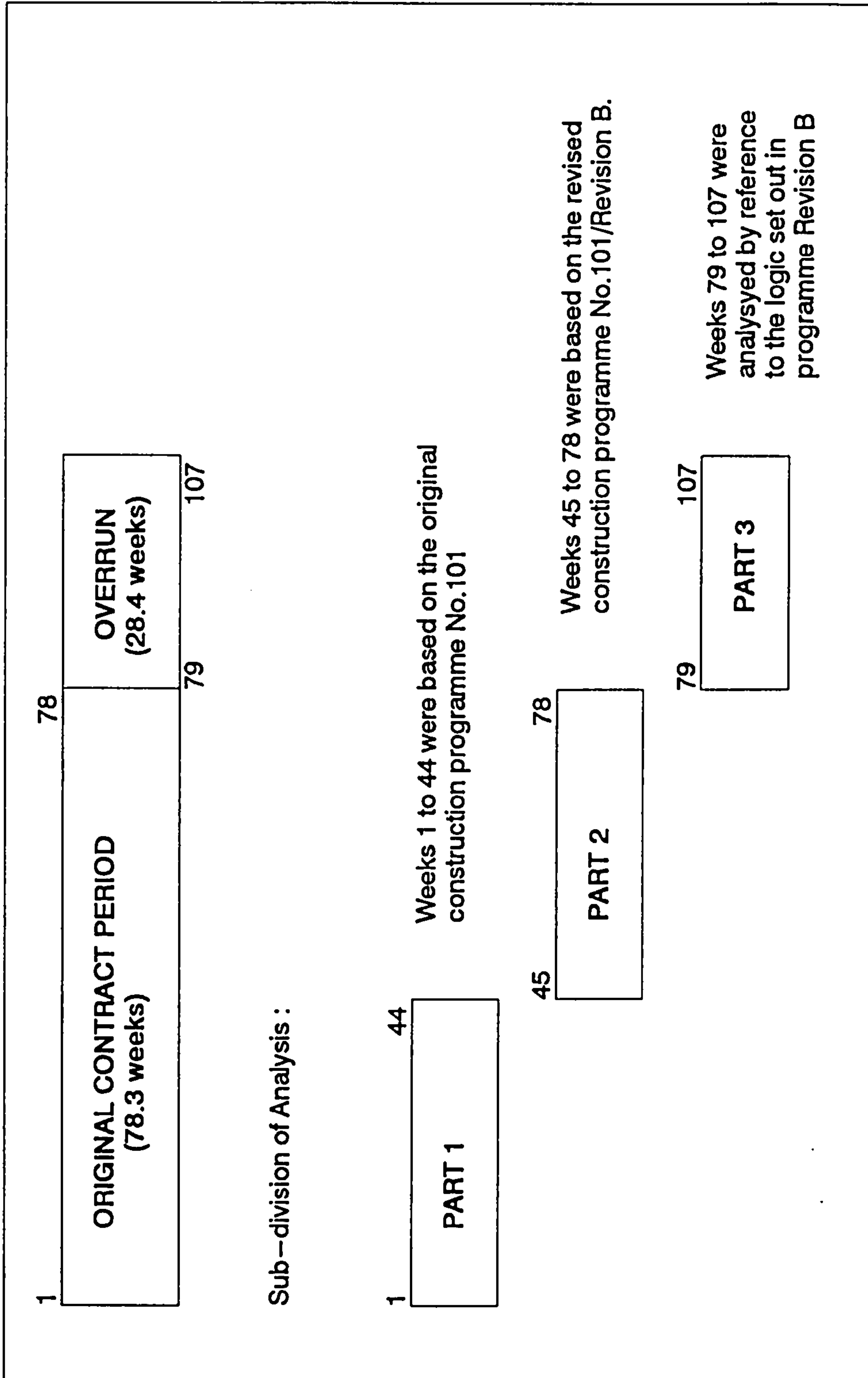


Figure 6.1 Illustration of analysis approach

### 6.3.1 STAGE 1 INVESTIGATION      Data Capture and Initial Processing

#### (a) Data Capture

Data capture was effected by a 3 man team of consultants who identified and recorded likely causes of critical delay separately on individual data capture sheets. The latter were designed specifically for this task, that is, for the purpose of gathering and source identification of essential information in a controlled manner for subsequent processing and analysis. An example of a blank data capture sheet is shown at **figure 5.2**

The initial forensic research into a claim is, in the authors experience, the most important task in the whole process, validating or otherwise the substance of a claim. In addition, and in particular on large construction projects such as this, it is likely to be the most expensive part of the process and consequently must be as controlled and exacting as possible.

It was essential that the data captured was the best factual record that could be obtained in respect of the alleged critically delaying causes, and that sufficient data was gathered through the discipline of the proposed systematic data capture format so that the STAGE 2 - Critical Delay calculation could be computed.

Each data capture sheet clearly identified the project by name and allocated job number, the consultant(s) who had completed the sheet, and the date it was signed off.

The key claim-specific information recorded for each head of delay included the following:-

- Dates upon which delay commenced and ceased.
- Date(s) when written notice(s) issued.
- Contractual reference(s).



- Brief narrative description of delay cause, and critical effect to include identification of the principal activity affected on the construction programme, and how it was affected.
- Full reference to the evidentiary source data which would be relied upon, for example: correspondence, drawings, registers of instructions, changes and most importantly transcripts of verbatim statements taken from potential witnesses.

Finally photocopies of all source evidence were appended to each data capture sheet which then passed a preliminary screening to eliminate weak or unsupportable delay heads.

The process commenced with a preliminary interview of key project staff who provided initial identification of likely causes of critical delay, each of which was recorded on a separate data capture sheet. The investigation then switched to a review of the available source documentary data as described in 6.2.2 (c).

During this literature research the investigatory team were seeking material evidence to support the verbal indications of critical delay together with a further task of uncovering evidence of delays not so far indicated. Again the same data capture procedure was adapted.

An example of a completed data capture sheet is shown at **figure 6.2**

<b>DATA CAPTURE SHEET</b>	
<i>CoSTAR</i> (Form Co.01)	
<b>JOB TITLE</b>	: Project 101
<b>JOB NUMBER</b>	: Trial Run
<b>CONSULTANT</b>	: J. Smith
<b>DATE</b>	: 10.8.1993
<b>Delay Title</b>	: MARBLE SURVEY
<b>Delay Ref no.</b>	: 1.2
<b>Delay Start date</b>	: 3.3.1992
<b>Delay Finish</b>	: 18.3.1992
<b>Date(s) of Written Notices</b>	: 25.2.1992
<b>Contract Delay clause(s)</b>	: Clause 25
<b>CAUSE OF DELAY</b>	(Brief narrative description)
<p>The removal of marble wall linings, carried out by a specialist subcontractor, was delayed by a requirement to carry out an additional survey.</p>	
<b>EFFECT OF DELAY</b>	(Brief narrative description)
<p>Caused delay to the demolition works, particularly in the entrance and stairwell areas.</p>	
<b>DELAY IMPACT ON PROGRAMME ACTIVITIES</b>	
<p>Activity 003 delayed start 11 days            Activity 010 delayed finish 16 days</p>	
<b>SOURCE EVIDENCE</b>	
<p>Letter MC - PM 24.3.1992            Letter PM - MC 2.4.1992            Letter MC - SC 15.4.1992</p>	

Figure 6.2 Example of a completed CoSTAR Data Capture sheet.

The timescale parameters set for the investigatory stage, which were in fact achieved, was some 2-3 weeks for each phase of the investigation.

#### **(b) Data Processing - Master Schedule of Delay**

Once data capture sheets were completed for each part of the assessment they were collated and the drafting of a 'Master Schedule of Delay' was commenced using the heads of causative events identified during the investigation.

An example extract from a draft master schedule of delay is enclosed at **figure 6.3** where it will be observed that the delay item recorded on the data capture sheet shown in **figure 6.2**, in this case a critical delay, is represented by item **1.2** on the schedule.

As a result of the preliminary investigations a considerable number of individual items of alleged delays were recorded in schedule format, with those considered to be significant being brought into the body of the claim assessment and criticality being assigned as computed from the **delay impact simulation**. **Table 6.7** provides a concise numeric breakdown of the delays found by cross reference to the individual assessment part. It is stressed that the sub-division into 3 separate sections was principally to assist in the management of the assessment task and was adapted to fit with the logical sequence of the original construction programme, revision B, and the discrete time overrun.

A point to note is that it was recognised that as this trial was being run in a live situation and accordingly in several instances, the system had to remain flexible and respond to other requirements without compromising the integrity of the test.

An example of this was the inclusion in the Contractor's assessment of all delaying matters other than those shown to be critical from the **Delay Impact Simulation** exercise. Though even this compromise stemmed from a claim that the global effect of so many delays, though non-critical, individually did amount to a separate head of claim.

	<b>Number of Delays Included in Master Schedule of Delay</b>	<b>Number of Individual or Grouped Delays Included in Descriptive Narrative Report</b>	<b>Number of Critical Delays Computed from Delay Impact Simulation</b>
<b>Part 1.0</b> (Original Programme) Weeks 1 to 44	87	12	5
<b>Part 2.0</b> (Revision B) Weeks 45 to 79	226	26	10
<b>Part 3.0</b> (Overrun Period) Weeks 79 to 107	162	10	3
<b>TOTALS</b>	<b>475</b>	<b>48</b>	<b>18</b>

**Table 6.7** Numeric Breakdown of delays uncovered by the CoSTAR approach at STAGE 1.



**(c) Data Capture - Schedule of Progress**

An essential element of the calculation of critical delay process is the importation of actual progress during the delay impact simulation.

This part of the process addresses the twin issues of critical delay concurrency, and Contractors own delay culpability, and differs radically from the traditional approach.

Thus at this stage a **Schedule of Progress** was prepared based upon the Contractors records of progress which in the main comprised a monthly report prepared in advance of site meetings. Every effort was made to ensure the progress information relating to each activity was as accurate as possible. The schedule was prepared using LOTUS 123 software.

**At the conclusion of STAGE 1, the following data had been gathered and processed into information:**

- **All the likely causative events of critical delay had been identified and listed in the draft Master Schedule of Delay.**
- **Each causative event identified on the data capture sheets was accompanied by a brief descriptive narrative of the CAUSE and delaying EFFECT, together with particulars of the delay and the appropriate contractual references.**
- **Essential evidentiary references were recorded against each event, with major delaying events being accompanied by photocopied bundles of relevant documents.**
- **A Schedule of Progress was prepared which identified and tracked the "as built" history of each operation.**

### 6.3.2 STAGE 2 - ANALYSIS Delay Impact and Critical Delay Computation.

Before any simulation or computation operations could commence 2 preliminary tasks had to be undertaken.

The first task was the preparation of a computer based model of the construction programme relevant to each part of the assessment. For example the first model was based on the original construction programme No./101.

For this project the construction programme, which was printed in bar chart format for site use, had been prepared using critical path methodology, that is all the activities had been logically linked into a network such that a critical path of activities could be readily identified at any stage in the progress of the project.

The logic linking network used by the Contractor was scrutinised by the expert planner to identify and note any obvious flaws or gross inconsistencies.

In the case of this project none were found to be present and the expert planner was prepared to accept and adopt the Contractor's logic. He produced a brief statement to this effect and also produced a **Logic Listing Report** which detailed the precise constraints each activity was subject to and which was made available to allow full inspection at a subsequent stage by other parties.

The second task involved the compilation of a **Schedule of Delay Impacts**. this was formed from data gathered at STAGE 1 and comprised a 'listing of activity constraints' based upon the delaying effects on certain operations. This listing was sorted into chronological order, an essential requirement prior to the delay impact simulation exercise.

On both of the above tasks key members of the Contractor's project site production staff were invited to provide comment and input to ensure as far as possible the

integrity of the exercise.

**We now move to an important point in the process which is critical and central to the new approach, namely using computer aided techniques to more accurately assess quantum and liability in this type of claim.**

The **CoSTAR** methodology employed by the expert planner, whilst seeking results through retrospective analysis, is essentially a forward going process comprising the following routine.

- (a) From the **Schedule of Delay Impacts** the timing, description and constraints to be imposed on the computer based model are identified. In this case the first item was *"1.1 Additional asbestos removal"*.
- (b) Having identified the time when the first delay item came into effect, the planner consulted the **Schedule of Actual Progress**, and updated the entire model programme to simulate progress achieved on site just prior to the impact of the delay item. The whole network was then calculated to identify any slippage which may have taken place prior to the delaying event having occurred.

**It is by adopting this approach that it is possible to account for the important factor of Contractors' under performance and thus culpability in the event of critical delays.**

For the first item analysed (*"1.1 Additional asbestos removal"*) the computer calculated that no slippage had occurred.

- (c) The planner then imposed constraints from the **Schedule of Delay Impacts** upon the computer based construction model programme which reflected the localised immediate effect of the delay caused by the **"Additional asbestos removal"**. The combined power of CPA techniques and computer

technology was brought to bear by recalculating the whole network to compute what delay, if any, had been caused to the project completion date.

In this instance the first item "*1.1 Additional asbestos removal*" revealed no apparent critical delay had been caused by this event. However when the whole exercise was repeated for the second item "*1.2 Marble survey*" a critical delay of 2.8 weeks was computed and is recorded in 6.4

- (d) Each time the planner impacted a delay and recalculated the network he saved the whole data package to a file, a sort of "snap shot" record, and made a copy in readiness for the next impact. This whole process was repeated until all the delay causes sited in the **Schedule of Delay Impacts** had been imposed as described above. Each result was recorded and where a critical delay was indicated the data was transferred to the **Master Schedule of Delay**. A listing of the principal causes of delay computed to be critical is shown in table 6.8.



Ref No.	Principal Cause of CRITICAL Delay Identified using the CoSTAR approach.	Critical Delay (Weeks)
<b>PART 1</b>		
1.2	Marble survey	2.8
1.4	Steel survey and associated exposure works	3.0
1.6	Service holes	4.0
1.11	Mechanical changes in kitchen	5.2
1.12	Lower ground floor A/C ductwork	1.2
		<b>16.2</b>
<b>PART 2</b>		
1.1.1	Handrails	1.0
(40)	5th floor screed	0.3
(56)	Modifications to mechanical controls	1.8
(57)	Modifications to 24 hr controls	1.7
(59)	FCU pipework - Lightwells(1.2.3 FCU's L/wells)	4.7
(61)	Diffusers and plenums	4.0
(63)	HVAC Details	0.3
(84)	Power Information	0.5
1.4.3	Joinery FCU's (144)	0.5
1.4.4	Fibrous plaster (160)	4.3
		<b>19.2</b>
<b>PART 3</b>		
1.1.1	Fibrous plstr and susp.clgs inc s/c no.1	6.2
1.1.3	Joinery	1.4
1.1.4	Fire stopping	3.8
		<b>11.4</b>
<b>WINTER HOLIDAY</b>		
21.12.91 TO 5.1.92 (inclusive) 2 Week shutdown included in Impact analysis. [Source: FCEC & NJCB]		
<b>TOTAL</b>		<b>46.8</b>

Table 6.8 Schedule of delay events found by CoSTAR to have caused critical delay.

One further task the expert planner undertook was to produce an "as built" record of the works in bar chart format using the Schedule of Progress and any other factual data which was made available to him.

**At the Conclusion of STAGE 2 the following tasks had been achieved:**

- **A Schedule of Delay Impacts was prepared comprising a listing of constraints to be imposed on the simulated computer based programme model which would reflect the localised immediate effect of each item or cause of delay.**
- **A computer based simulation model was prepared of the original construction programme with all work activities logically linked.**
- **A Logic Listing Report together with expert planners opinion on the validity of the originally employed network logic was produced.**
- **A list of items calculated to have caused critical delay to the completion date following the delay impact simulation exercise was drafted with the results being transferred to the Master Schedule of Delay.**
- **The production of an "As Built" record in bar chart format for easy visual reference.**
- **A brief narrative report from the expert planner describing the process undertaken during STAGE 2 and identifying/explaining any unusual items or occurrences.**

### 6.3.3 STAGE 3 - EVALUATION

### Master Schedule of Delay with Descriptive Narrative

This stage of the process comprised 2 distinct activities in preparation for the final stage, namely the finalisation of the **Master Schedule of Delay** and the preparation or editing of **descriptive narrative** text to accompany the 'Principal Causes of Delay'.

#### (a) Master Schedule of Delay

This is the **central document** to the whole assessment process, embodying as it does essential details of the **cause and effect** of each claimed delay together with the results of the **delay impact simulation** exercise which identified and quantified critical delay effects.

In **figure 6.3** (Extract from Master Schedule of Delay) an example of a **Master Schedule of Delay** entry is illustrated. The information is displayed in columns and sourced as set out in **table 6.9**.

<b>COLUMN</b>	<b>DESCRIPTION</b>	<b>SOURCE</b>
1	Reference No	Data Capture sheet
2	Title and Cause of Delay	Data Capture sheet
3	Effect of Delay	Data Capture sheet
4	Documentary Reference	Data Capture sheet
5	Written Notice References	Data Capture sheet
6	Contractual Clause References	Data Capture sheet
7	Delay to Project Completion	Data Impact Simulation

**Table 6.9** Data sources for Master Schedule of Delay

CoSTAR (Form Co.02) MASTER SCHEDULE OF DELAY						
JOB TITLE : PROJECT 101						
JOB NUMBER : TRIAL RUN						
Ref. No.	TITLE and CAUSE of DELAY	EFFECT of DELAY	DOCUMENTARY SOURCE References	WRITTEN NOTICE References	CONTRACT CLAUSE References	DELAY TO PROJECT COMPLETION
1.2	<u>MARBLE SURVEY</u> Delayed removal of marble wall due to requirement for additional site survey.	The delay to the activity of removing the marble wall linings together with the additional work involved in the survey delayed the execution of Demolition works.  ( For full particulars refer to narrative 1.2 )	Letters: 24.3.92 MC - PM 2.5.92 PM - MC 15.4.92 MC - SC	Reference : JS/jo/005 25.2.92	Clause : 25	2.8 weeks

Copyright P J Keane

Figure 6.3 Example sheet from a CoSTAR Master Schedule of Delay



The importance of this document is that it is designed to clearly set out and demonstrate causation and the directly linked effect(s) together with factual evidential, and contractual/legal references. **The Master Delay Schedule** for this project ran to 102 pages in total and contained 475 items of delay. For a further breakdown refer to **table 6.7**.

**(b) Descriptive Narrative Texts**

In order to assist the respondent in their review of the Contractor's claimed assessment, a narrative text providing fuller particulars (than those given in the Master Schedule of Delay) was prepared for each "*Principal cause of Delay*".

In effect this narrative was an extension of the brief description gathered by the **data capture sheets**, but now providing full particulars and cross referencing to all the material evidence which was to be relied upon in support of the particular delaying item or cause.

The reasoning behind providing a descriptive narrative for all 48 principal causes of delay and not just the 18 computed as having been critical (is twofold).

Firstly the items of delay identified as being "*Principal causes*" were deemed to be of such significance in that they were a major contributory cause to overall critical delay of the works, but in many instances were either concurrent critical causes of delay, or were only slightly less effective in their critical delaying impact on the Contractors progress. (This was later borne out by the traditional expert assessment results).

The second part of the reasoning concerned the Contractor's objective which was to demonstrate not only that the critical delays to completion were not their liability, but also to persuade the respondent that a considerable quantity of disruption had occurred throughout the progress of the works. As previously stated the trial run was taking place on a 'live project' and as such had to reflect

and be prepared to accommodate this fact. However as disruption was not a part of this trial implementation it was ignored. The inclusion of all items of delivery did not in any way negatively affect the integrity or validity of the trial.

Finally all documentation referred to and relied upon in the narrative text and originally attached to the relevant date capture sheets was compiled into bundles for inclusion in clearly marked appendices.

**At the conclusion of STAGE 3 the following tasks had been achieved**

- **A Master Schedule of Delay had been finalised clearly identifying each alleged delaying event, causation and linked critical effect, fully cross referenced as to support documentation and contractual basis.**
- **A descriptive narrative particularising each principal cause of delay was prepared.**
- **Collation of support bundles of documents referred to in descriptive narrative text for inclusion in appendices.**

#### **6.3.4 STAGE 4 - RESULTS      Compilation of Final Claim Assessment.**

Essentially this stage comprised compiling and presenting the result of the systematic approach to data gathering, processing and delay impact simulation in a lucid and logical report style format.

The most important objective being to communicate the trial results clearly, avoiding ambiguity and making allowance for complete and open source inspection for any part of the claimed assessment.

The format of the formal submission was similar to traditional approaches and was structured in sections as follows:

- **Preambles**

An introductory section which comprised title and contents pages, brief summary of claimed assessment, brief details of the project, guide to the claim document and a concise section on the legal and contractual basis of the claim.

- **Text**

This section contained the descriptive narrative text particularising the principal causes of delay which in total amounted to 48.

- **Schedules**

In this section the **Master Schedule of Delay** was included together with the **Schedule of Actual Progress**, and the **Schedule of Delay Impacts (constraints)**.

- **Charts and Programmes**

A reproduction of the Contractor's original programme was included, together with a computerised version of the same issue upon which the delay impact simulation was imposed. Also in this section was a copy of the "*as built*" record in bar chart format.

- **Reports**

The reports included a statement from the expert planner explaining the methodology he had employed, and a full print of the construction programme logic listing identifying the network linkage between each and every activity.

- **Evidence**

This comprised essentially of the copied supporting documentation enclosed in the appendices upon which the descriptive narratives sought to rely, and also copies of the full delay impact simulation exercise on 3½" computer diskettes.

As previously stated all of the above data and information was compiled into traditional report style format (all word processing tasks being achieved using Word Perfect version 5.1), eg typed text, double spaced, interleaved with dividers, and bound in a proprietary binding system.

Finally and in consultation with the Contractor who has been kept informed throughout the process, copies were distributed under cover of an explanatory letter to all relevant parties.

#### **6.4 Analysis and Results of the Trial Run Implementation**

Having reported on the controls and methodology used in the trial implementation this section presents an analysis of the results, the achievements made, considers problems encountered and contrasts the new **CoSTAR** approach with an expert traditional assessment approach arrived at under an ADR (Alternative Dispute Resolution) agreement.



#### 6.4.1 Analysis of the Results

The results of the **delay impact simulation** are shown in **table 6.8** with critical slippage for each of the 3 parts being shown separately. (Refer to paragraph 6.3.1, (a), and **figure 6.1** for explanation on sub divided parts).

Figure 6.4 illustrates graphically the computation of critical delay for each part of the overall contract period.

**A first observation** was that the sum total of the critical delay slippage identified for each part of the total contract period, that is **46.8 weeks** exceeded the actual overrun period of **28.4 weeks** by **18.4 weeks**.

This apparent flaw in the system may be explained in 2 ways. Firstly when the Contractor re-programmed the works for Revision B it was their view that they would be able to reduce the slippage through a re-sequence of operations which would be reflected in the revised contract programme. In their view this saving in time would be a maximum of 12 weeks. The second way in which the apparent excess figure came about may be explained by the fact that the works were, prematurely terminated by mutual agreement between the Contractor and the employer. In the Contractor's view the works left outstanding and unfinished would have required a further 4-8 weeks to complete.

Thus the summation of there 2 time periods would indicate that the total sum of the delay impact analysis could be reduced by between 16 and 20 weeks, thus leaving the balance equating to the actual time overrun.

This matter is further commented upon later in this chapter when the **CoSTAR** approach is contrasted with the results of a separate traditional expert assessment approach.

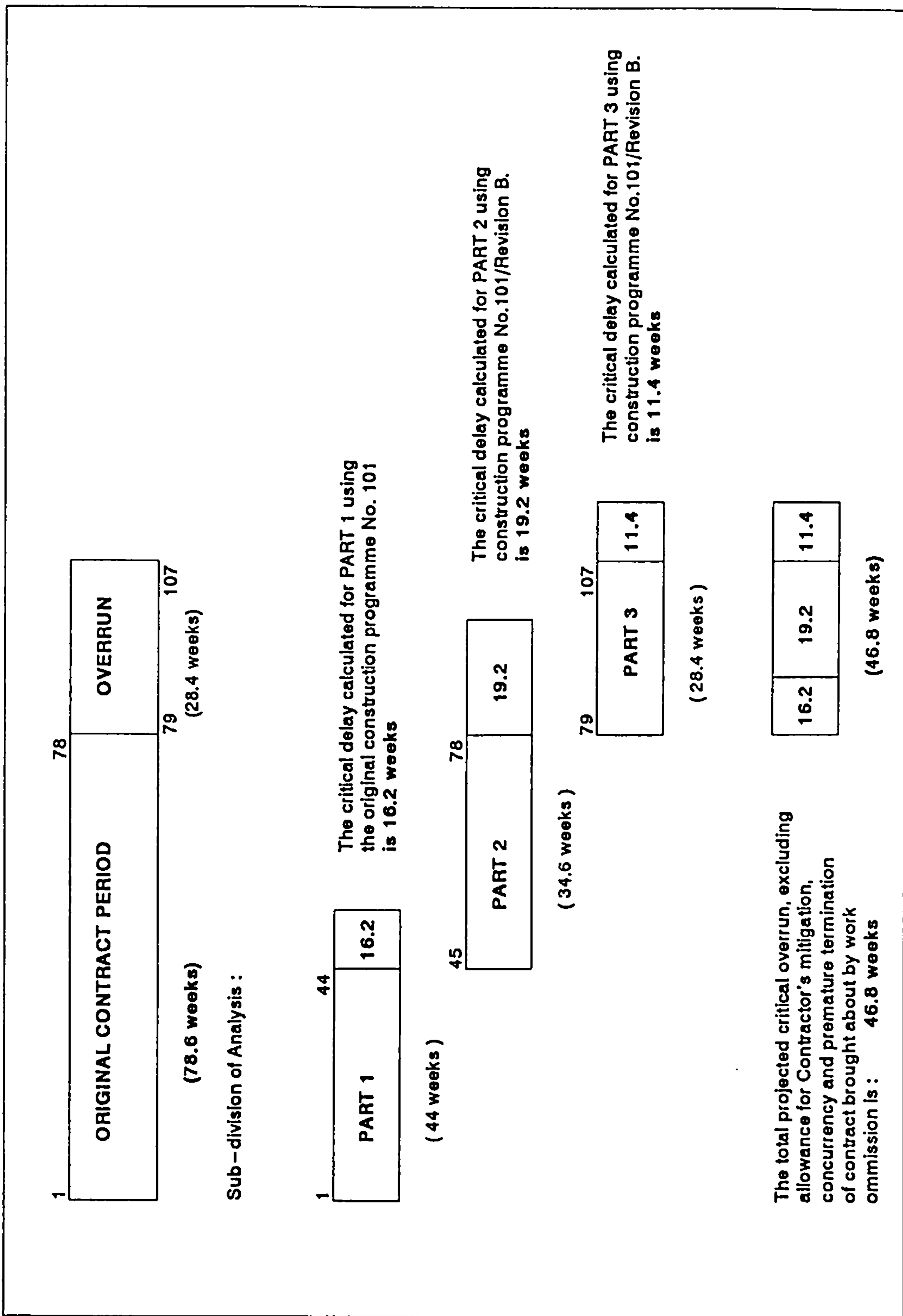


Figure 6.4 Illustration of the critical delays computed following the DIS exercise.

A second observation noted that the incidence of critical delay occurring was spread throughout the contract period, and not confined to 1 or 2 single events.

#### **6.4.2 Achievement of The CoSTAR Technique Approach**

In paragraph 6.3 it was observed that whilst the Contractor alleged that the total 28.4 week overrun to the construction contract period was directly caused by employer interference, and had made submissions to this effect, the employer held a contrary view and had awarded an extension of time of only 1.4 weeks. This approximated to some 5% of the actual time overrun.

The application or implementation of the new CoSTAR approach identified and quantified from the delay impact simulation exercise, 18 no causes of critical delay amounting to 46.8 weeks of slippage, but subject to reduction of 16-18 weeks to reflect Contractor's mitigating actions and unfinished work content.

At the very least the results of the CoSTAR Technique implementation throw serious doubts on the assessment of 1.4 weeks currently granted and indicate it should have been considerably more.

The observations taken from this comparison are reported later in this chapter, in the meantime the achievement of system objectives as set out in chapter five (5.5.5) for testing the CoSTAR approach are checked against the results of the trial run as set out in 6.7.

(This page not used)



<b>ACHIEVEMENT OF PROPOSED CoSTAR APPROACH SYSTEM OBJECTIVES MEASURED AGAINST RESULTS OF TRIAL RUN</b>		
<b>Objective No.</b>	<b>OBJECTIVE</b>	<b>ASSESSED TRIAL RUN RESULT (%)</b>
1.	<b>IDENTIFY</b> each causative event which has affected or contributed to an alleged delay.  (For inclusion in the Master Schedule of Delay)	<b>Achieved 95%</b>
2.	<b>IDENTIFY</b> and <b>SCHEDULE</b> the essential source material evidence pertaining to each causative event.  (For inclusion in the Master Schedule of Delay and for use in collation of supporting documentary bundles appended to claim assessment)	<b>Achieved 100%</b>
3.	<b>IDENTIFY</b> and <b>SCHEDULE</b> historic progress of the works for each programmed activity.  (For inclusion in the Schedule of Progress)	<b>Achieved 75%</b>
4.	<b>IDENTIFY</b> and <b>TAG</b> each causative event with the contractual/legal basis of the claim.  (For inclusion in the Master Schedule of Delay)	<b>Achieved 100%</b>
5.	<b>CONSTRUCT</b> a computer based model of the original construction programme with all the interdependent activities fully logically linked.  (For use in the Delay Impact Simulation process)	<b>Achieved 100%</b>

Table 6.10

( continued on next page.....)

<b>ACHIEVEMENT OF PROPOSED CoSTAR APPROACH SYSTEM OBJECTIVES MEASURED AGAINST RESULTS OF TRIAL RUN</b>		
<b>Objective No.</b>	<b>OBJECTIVE</b>	<b>TRIAL RUN RESULT (%)</b>
6.	<b>INTERPRET</b> the scheduled causative events in terms of localised construction programme constraints.  (For inclusion in the <b>Schedule of Delay Impacts</b> )	<b>Achieved 100%</b>
7.	<b>CALCULATE</b> the critical delay effect of each alleged causative event resulting from the <b>DELAY IMPACT SIMULATION</b> exercise.  (For inclusion in the <b>Master Schedule of Delay</b> )	<b>Achieved 100%</b>
8.	<b>CONSTRUCT</b> an <i>As-Built</i> record tracking the historic progress of the works.  (For inclusion in the <b>Claim Assessment Submission</b> )	<b>Achieved 75%</b>
9.	<b>DESCRIBE</b> in narrative format full particulars of each causative event of a critical delay, cross-referenced to the <b>Master Schedule of Delay</b> , the appended <b>Bundle of Documentary Evidence</b> , and any other relevant source.	<b>Achieved 100%</b>
10.	<b>COLLATE</b> the analysis results and supporting evidence into a report style format to include :- <i>introductory preambles, narrative text, schedules, charts, programmes, reports, and copied documents.</i>	<b>Achieved 100%</b>

Table 6.10 Test result of CoSTAR system objectives trial.

### **6.4.3 Comparison of the CoSTAR Technique Approach with that of the Traditional Approach**

In a slightly unusual turn of events the Employer, (in subsequent agreement with the Contractor) decided that rather than have his professional team review and respond in detail to the Contractor's CoSTAR prepared claim assessment, he would instead follow a more traditional approach seeking an assessment based upon independent expert judgemental analysis.

Consequently, under a quasi ADR agreement each side appointed an independent expert to act as joint assessors in reviewing the Contractor's claim assessment in its entirety. The Experts appointed were a Principal of large architectural practice who is also a Professor of Architecture, and a Director of an International Construction Consultancy who is a Construction Management expert. This process comprised the convening of some 20 claims review meetings at which both parties were represented and required to make presentations on each alleged head of delay. The joint assessors held a similar number of subsequent/ parallel meetings at which they considered the evidence presented to them, other job specific data in their possession and arrived at their assessment for recommendation of time extension awards.

**The above circumstance created an exceptional opportunity for directly contrasting and or testing the CoSTAR technique trial run with that of the more usual traditional expert analysis and assessment approach, all in a major *"live project"* situation.**

The whole ADR process took approximately 16 months from commencement to publication of award recommendation, compared with the CoSTAR approach which took just 4 months from initial investigation to calculated assessment of critical delays.

The appointed joint assessors reached a very high degree of agreement during the

course of their analysis concluding in a unanimous recommendation that **in their combined opinion an appropriate extension of time award would amount to 20.2 weeks set against 8 critical causes of delay and a 2 week site shutdown for holidays.**

**This finding equated to approximately 72% of the actual contract overrun of 28.4 weeks and incidentally went a considerable way to endorsing the results of the CoSTAR approach which also indicated that the original employers assessment of 1.4 weeks was inadequate.**

A comparative analysis of the critical delays identified by each alternative approach is set out in **table 6.11** and totalled 21 items, 18 identified by **CoSTAR**, 9 by the expert assessors.



Ref No.	Principal Cause of CRITICAL Delay	CoSTAR Assessment (Weeks)	Independent Expert/ADR Assessment (Weeks)	
<b>PART 1</b>				
1.2	Marble survey	2.8	2.0	C
1.4	Steel survey and assoc. exposure works	3.0	0.0	N
1.6	Service holes	4.0	2.0	C
1.7	Floor repairs	0.0	1.4	C
1.10	Construction of ring beam 5th floor	0.0	0.6	C
1.11	Mechanical changes in kitchen	5.2	0.0	N
1.12	Lower ground floor A/C ductwork	1.2	0.0	N
		<b>16.2</b>	<b>6.0</b>	
<b>PART 2</b>				
1.1.1	Handrails	1.0	0.0	c
(40)	5th floor screed	0.3	0.0	N
(56)	Modifications to mechanical controls	1.8	0.0	N
(57)	Modifications to 24 hr controls	1.7	0.0	N
(59)	FCU pipework - Lightwells(1.2.3 FCU's L/wells)	4.7	4.8	C
(61)	Diffusers and plenums	4.0	1.0	C
(63)	HVAC Details	0.3	0.0	N
1.3.5	Kitchen	0.0	0.4	C
(84)	Power Information	0.5	0.0	N
1.4.3	Joinery FCU's (144)	0.5	0.0	N
1.4.4	Fibrous plaster (160)	4.3	incl.	C
		<b>19.2</b>	<b>6.2</b>	
<b>PART 3</b>				
1.1.1	Fibrous plstr and susp.clgs inc s/c no.1	6.2	6.0	C
1.1.3	Joinery	1.4	0.0	c
1.1.4	Fire stopping	3.8	0.0	N
		<b>11.4</b>	<b>6.0</b>	
<b>WINTER HOLIDAY</b>				
21.12.91 to 5.1.92 (inclusive) Shutdown [Source : FCEC & NJCBI]		incl.	2.0	
			<b>2.0</b>	
<b>TOTAL</b>		<b>46.8</b>	<b>20.2</b>	
Key: C - Critical Delay, c - concurrent N - Non critical				

Table 6.11 Comparison of critical delays identified from alternative approach(es)

It will be observed that there was a significant incident of concurrence, or agreement in the findings of each approach and that they commonly identified 6 no. heads of delay as being critical though differing on quantum assessment.

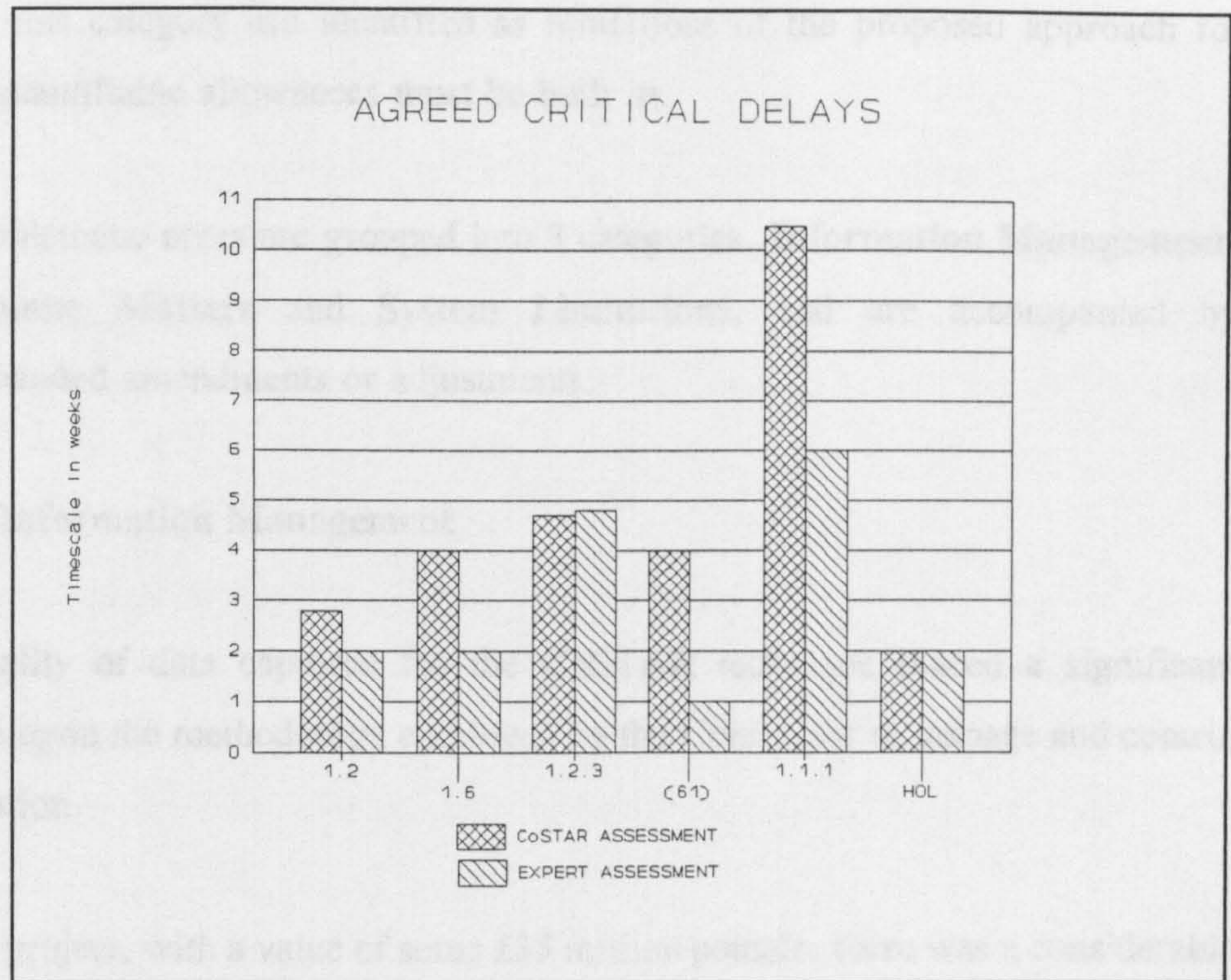
Table 6.12 identifies these 6 agreed delays which for the CoSTAR approach equate to 26 weeks (or 92% of the overrun period), and 17.8 weeks (or 63%) for the traditional Expert approach.

Ref no.	PRINCIPAL CAUSE OF DELAY	CoSTAR	EXPERT
1.2	Marble Survey	2.8	2 CRITICAL DELAY
1.6	Service Holes	4.0	2 CRITICAL DELAY
(59)	ECU's Lightwells/(59) FCU pipework	4.7	4.8 CRITICAL DELAY
(61)	Diffusers and plenums	4.0	1 CRITICAL DELAY
1.1.1	Fibrous Plaster and susp.clgs.incl Staircase No.1 (1.4.4 Pt 2)	10.5	6 CRITICAL DELAY
HOL	21.12.91 TO 5.1.92(inclusive)Shutdown incl [SOURCE: FCEC & NJCB]		2 CRITICAL DELAY
<b>TOTAL</b>		<b>26.0 (92%)</b>	<b>17.8 (63%)</b>

Table 6.12 Agreed critical delays using each assessment approach

A graphical illustration of the agreed critical delays is shown in figure 6.5 identifying the relationship and quantum variance between the findings of both approaches.





**Figure 6.5 Comparison between alternative assessment results**

From the foregoing it is deduced that a substantial proportion of the contract period overrun was caused by critical delays which were **not** the liability of the Contractor.

Further, that whilst the **CoSTAR** approach is not claimed at this stage to be 100% accurate, the traditional expert approach is also subject to scrutiny in this respect.

### **6.5 Problematic Issues and Recommended Solutions**

Problems and or limitations were identified both within the Contractor's operational domain and the **CoSTAR** approach trial implementation.

All of the shortcomings identified can be addressed by the introduction of amendments or adjustments to either the newly proposed procedure, or the Contractor's construction management operational procedures. Those that fall



outside this category are identified as limitations of the proposed approach for which quantifiable allowances must be built in.

The problematic areas are grouped into 3 categories, **Information Management**, **Programme Matters** and **System Limitations**, and are accompanied by recommended amendments or adjustments.

### **6.5.1 Information Management**

The quality of data captured for the CoSTAR technique placed a significant reliance upon the methodology employed by the Contractor to manage and control information.

On this project, with a value of some £35 million pounds, there was a considerable quantity of information and data generated during both the pre and post contract phases of the project which required the use of accurate and effective (yet economic) distribution, recording, filing and retrieval systems.

#### **Problem 1**

Whilst in the main these systems had worked to an extent in their traditional format, deficiencies were discovered during the SATGE 1 data capture operation consisting in the main of incidents of inadequate, incomplete or missing records and difficulties of retrieving data.

This had a limiting effect on the CoSTAR process in the following way. It resulted in incomplete data capture sheets, which in turn affected the integrity of both the **Schedule of Delay Impacts** and **Master Schedule of Delay**.

#### **Recommendation 1**

In the main this problematic issue is one of devising and implementing a **workable** computerised system with a common core of information readily accessible to



authorised individuals through an efficient retrieval system.

With the current costs of computerised data management and retrieval systems, incorporating CD Rom technology, falling at a significant rate the adoption of this type of information management equipment will not only become cost effective, but almost certainly mandatory for construction companies operating on the larger projects.

The effectiveness of implementing any such system will depend to a great extent on the reception of staff who will require re-training and in some cases re-educating in the control and management of information. The whole process can be disciplined and controlled through the use of Q and A style procedures.

The benefit the above would bring to the implementation of the **CoSTAR** approach to delay analysis is to **improve the quality of data captured**, and to **considerably speed up the process** (for example by using computerised data sort and query tools), particularly when the **CoSTAR** approach is fully automated and computerised.

The initial data capture would comprise an electronic interrogation of the Contractor's computerised data-based records, which when combined with the application of the expert knowledge of the investigator to the data captured would produce the essential information required to analyse, compute and particularise a claim assessment.

## **Problem 2**

A further problematic area of an evidentiary nature, which affected detrimentally both the **data capture and delay impact simulation** process of the **CoSTAR** approach, was related to information provided by the Contractor's project team.

It is natural, as indeed was the case that reliance solely on the memory of events

occurring on a fast track, complex, multi million pound refurbishment project of over 2 years duration produced recollections that were in part deficient being prone to inaccuracy and/or exaggeration.

### **Recommendation 2**

To a great extent automated data capture as recommended above would considerably relieve the requirements to rely upon the weaknesses of human memory. However it is recommended that key members of the Contractor's project staff ought to be encouraged to maintain an individual project log or diary which would be available for inspection.

This would assist greatly in the capture of **factual data**.

### **6.5.2 Construction Programme**

Shortly after the commencement of the site works the Contractor was forced to depart from his original construction programme in a significant way due to events which arose.

The ramifications of this departure on a complex project of this nature were considerable from a planning, controlling and progress monitoring perspective. In addition there were construction management and contractual implications.

It was also recognised by the Contractor's project team that critical delays had arisen in the early stage of the works, and this led to the preparation and release of a major revision to the construction programme Revision B, (Revision A was never released). effective from week 45. It was the Contractor's site management view that this revision would mitigate as much as 10 to 12 weeks of critical delay which had occurred in this first part of the contract period.

As the CoSTAR technique based its first analysis simulation on the original

construction programme (calculating a slippage prior to Revision B release of 16.2 weeks) and then switched to basing analysis thereafter on Revision B a slight and potentially misleading interpretation could be drawn from the **CoSTAR** results.

This has been enlarged upon elsewhere, though in summary if the 16.2 weeks is reduced by say 10 weeks and the unfinished work element is assessed at 8 weeks the **CoSTAR** result equates exactly to the time overrun period.

A less dramatic aspect of proper planning and control, but equally important one was the recording of progress. Whilst a considerable effort had gone in to recording site progress the results were still inadequate in part and wholly deficient in certain key activity respects.

### **Recommendations**

With the advent of cost effective and flexible computer hardware technology and plethora of project management software, combined with tried and tested critical path analysis techniques, it should not present any well resourced Contractor with great difficulty in re-sequencing, re-evaluating and re-issuing of construction programmes incorporating essential timely revisions.

This is all the more essential when there is a significant departure from the logic of the Contractor's original intent. Construction planners and site management staff should however resist the temptation to re-vamp the revision to such an extent that the Contractor's **original intent** is lost or diffused by introducing for example a new structure to the programme with revised operation descriptions and numbering, or indeed the addition and/or replacement of a substantial number of activities. Both of the latter happened to some extent on this project.

### **6.5.3 The CoSTAR Technique Approach**

In paragraphs 6.5.1 and 6.5.2 it is observed how defective or flawed source records, verbal evidence and/or programme issues can have a detrimental effect

on the results of the **CoSTAR** approach.

The system itself would greatly benefit, and in turn improve its effectiveness and capability, by being fully automated and computerised. It is envisaged that this would allow initial data capture using high specification notebook computers combined with an industry standard suite of software tailored to create a core database of captured data for sharing and processing each stage of the **CoSTAR** approach.

This would include the development and incorporation into the system of pre-determined data capture masks, relational data base functions and interactive software eg spreadsheets, word processing, graphical array and databases output.

A final note on a current temporary limitation and that is the hostile response or rejection by respondents to this type of new approach, particularly the use of 'computer evidence'. However this will depend on the attitude and technological capability of the recipient and will eventually fade in time.

## **6.6 Summary and Conclusions**

### **6.6.1 Summary**

**Section 6.1** and **6.2** introduced the chapter content and the format of the procedures and methodology undertaken in the final part of the validation.

In **Section 6.3** the trial run of the **CoSTAR** approach was described by reference to the four stages of the process.

The analysis and results of the trial implementation are contained in **section 6.4**. It was shown that the **CoSTAR** approach was able to identify **18 no.** causes of critical delay out of 475 delay causes gathered at the data capture stage.



The **CoSTAR** technique recorded **94.5%** achievement in the pre-determined 10 no. "*system objectives*" devised for the trial run, resulting in a detailed analytical output comprising identification and quantification of critical delays which caused the original contract period of 78 weeks to overrun by 28 weeks or 36%. A list of these items is contained in **table 6.11**.

The results of the **CoSTAR** assessment compared favourably with those of the separate independent Expert approach, with a commonality of agreement being reached at least to the identity, if not the quantum, on 6 items of critical delay. **table 6.12** sets out these items which it will be observed equated to **26 weeks of critical delay** (or 92% of the actual overrun) on the **CoSTAR** approach and **17.8 weeks** (or 63%) for the **Experts assessment**.

The trial run uncovered a number of problematic issues inherent within the Contractors own sphere of operational influence, and within the **CoSTAR** approach. **Section 6.5** sets out recommendations for amendment, adjustment or alterations to improve both the Contractor's construction management processes and **CoSTAR**.

Finally, **section 6.6** comprises a chapter summary, conclusions drawn, and a link to the next stage.

### **6.6.2 Conclusions**

Based on the findings of the trial run validation test the author draws the following conclusions:

- The **CoSTAR** technique approach was capable of successful implementation in a live contract situation typical in nature and complexity to many of today's multi million pound, capital city, fast track construction projects.

- The approach was workable and expedient in producing calculated assessment results by effectively blending a conceptual technological approach using industry standard business computer hardware and software with traditional assessment methodology.
- **The CoSTAR approach supports the research Hypothesis.**
- The **CoSTAR** approach is considerably quicker than the traditional approach.

[The **CoSTAR** approach arrived at a detailed assessment in 4 months. The expert assessment using an ADR approach took 16 months].

- The **CoSTAR** approach is not confined to retrospective delay impact simulation, but could be used for forward risk analysis, and consequent strategic risk avoidance planning.
- The disciplined application of this approach provided several opportunities for the Contractor to adjust and improve aspects of his construction management procedures.

### **6.6.3 The Next Stage**

In the introduction to chapter six (section 6.1) it was noted that the trial implementation of **CoSTAR** Technique would be assessed in 2 parts. The first which comprised a trial run in a live project situation was reported upon in this chapter.

The next stage consists of the 2nd part of the trial assessment which took the form of a structured validation process. For this, selected experts were invited to review the **CoSTAR** approach, measure it against a set of predetermined system objectives and form observations and opinions as to the systems effectiveness. All such feedback was recorded and is set out, together with relevant annotation and clarification, in **chapter seven**.

---

# CHAPTER SEVEN

## VALIDATION BY EXPERT EVALUATION AND REVIEW

---

---

- 7.1**            **Introduction**
  
  - 7.2**            **External Experts**
    - 7.2.1          Selection and Notification
    - 7.2.2          Procedure for Validation
  
  - 7.3**            **Validation Process**
    - 7.3.1          Expert Interview
    - 7.3.2          Analysis and Interpretation of Interview Findings
    - 7.3.3          Additional Expert Commentary
  
  - 7.4**            **Conclusions**
    - 7.4.1          Summary and Conclusions
    - 7.4.2          The Next Stage
- 
-



# VALIDATION BY EXPERT EVALUATION AND REVIEW

---

## 7.1 Introduction

It was stated in **chapter six** that in order to assess whether the new procedure **CoSTAR** would work effectively it was necessary to test and validate the system.

The assessment was in two parts, with the first comprising a trial run on a "live" project. The results of this were analysed, evaluated and commented upon on **chapter six**.

This chapter deals with the second part of the assessment which took the form of a validation process conducted through experts review.

The selection, briefing and interview of the experts is reported together with an analysis of commentary on the findings of the review.

## 7.2 External Experts

### 7.2.1 Selection and Notification

The experts were selected on the basis of the following criteria:

- (a) Academic and Professional Qualifications.
- (b) Relevant Experience.
- (c) Relevant Expertise

In view of the nature and scope of the research topic, and the resultant new

approach which was to be tested, the author considered that the relevant background of the experts should include:

- (i) Construction planning engineering.
- (ii) Construction management.
- (iii) Construction claims management.
- (iv) Construction law.
- (v) Arbitration

Individuals who are considered to be expert in one or more of the above areas were selected and requested to assist in the validation process. Five agreed to take part, and are identified in **table 7.1**.

Occupation	Qualifications	Area of Expertise <sup>125</sup>
Planning Engineer Associate Director Contracts Consultant Construction Lawyer Arbitrator	FInst.Pet,MAPM,ACI Arb Msc,FRICS,FCIOB,ACI Arb MSc,FRICS,FCI Arb LLB,FCI Arb,Barrister <sup>126</sup> FRICS,FCI Arb,Barrister <sup>127</sup>	Construction Planning Construction Management Claims Management Construction Law Arbitration

**Table 7.1 - Panel of validation experts**

Each expert was written to setting out a brief introduction to the scale of the research project, the purposes of the validation process and the part they would be asked to play. An example of a briefing letter is enclosed at **appendix I**.

<sup>125</sup> For purposes of validation process, but not limited to.

<sup>126</sup> Not practising in chambers.

<sup>127</sup> Not practising in chambers

### 7.2.2 Procedure for Validation

The validation procedure for expert review basically comprised an interview at which the specification for the new approach was shown and explained with feedback being gained through both structured questions which measured the system directly against the system objectives, and additional commentary prompted by the discussions and the experts own experience.

The procedure could be summarised as a 3 stage process as follows:

#### (a) Pre Interview

- Select expert.
- Liaise with expert, convene interview meeting.
- Confirm meeting with letter containing brief introductory details.

#### (b) Interview Meeting

- Introduce nature and scope of research project (commencing by reference to briefing letter).
- Briefly report on progress of research and main findings.
- Explain fully the purpose of, and procedure for the validation process.
- Provide graphical introduction to **CoSTAR** supported by flow chart and explain the system.
- Demonstrate pro forma documents which control the process.
- Summarise the process.
- Employ "**Expert Validation questionnaire**" to test system objectives (See appendix J)

#### (c) Post Interview

- Analyse responses to questionnaire.
- Complete matrix report.
- Write up deductions and conclusions.

An important consideration which was borne in mind during the formulation and implementation of the above procedure was that the experts should consider whether the new approach would satisfy, or otherwise, the system objectives (and of course the thesis hypothesis set by the author) and not subjective thoughts or ideas of their own.

### **7.3 Validation process**

#### **7.3.1 Expert Interview**

The experts were consulted and interviewed at various locations, separately, in accordance with the procedure set out at (b) above, and the questionnaire was completed accordingly.

#### **7.3.2 Analysis and Interpretation of Interview Findings**

The 10 system objectives set out in chapter 5, section 5.5.5. were put to each expert in the form of a question using the prefixed statement:-

*"would the following system objectives be achieved by the implementation of the CoSTAR approach?"*

The responses, weighted between 0 for "No" and 10 for "Yes", were transferred to a matrix chart for analysis. See table 7.2, page 242.

This section sets out a commentary on the basis of the weighted responses to each question/objective and provides additional views prior to summarising the findings and drawing conclusions.



Taking each system objective in turn the author observed and recorded the following.

**Objective No.1      IDENTIFY each causative event which has affected or contributed to an alleged critical delay.**

The panel found that this objective would be achieved **78%** of the time.

One expert noted that the system would be dependent upon the standard of record keeping, and also observed that on a particularly complex job it may well be impossible to identify each and every causative event. A second expert whilst noting that in his view the data capture procedure should be quite capable of identifying the main causative events, much would depend on the quality and competence of the investigators in the field.

This latter view was shared by the construction lawyer.

The legal expert challenged the use of the word alleged in the objective description, observing that these critical delays must be deemed factual. The author acknowledges and accepts this point.

**Objective No. 2      IDENTIFY and SCHEDULE the essential source material evidence pertaining to each causative event**

For this objective the panel found that the **CoSTAR** approach would achieve its purpose **90%** of the time.

One expert raised the question "What is the safeguard in the system to ensure that all source evidence has been identified and reviewed?" The author responded by reference to section 5.5.3, of the thesis which deals with :

**"STAGE 1 - INVESTIGATION...Data Capture":-**

*"Before data capture commences, the first task will be to identify all the potential sources of recorded data...in whatever media it is available. In addition key project staff who may be required to provide essential witness testimony should also be identified and listed."*

However the author readily accepted that this failsafe approach could easily be formalised within the system by the use of a proforma check sheet which would be used to control the review of evidence both at pre and post investigation stages.

The planning engineer who has substantial experience giving expert evidence at tribunals and court hearings raised the question of *"who is to provide witness testimony to the delay?"* He recommended most strongly that draft witness statements from site staff must be included at STAGE 1 in order to provide a planning expert with as much data as possible from which to work when undertaking the delay impact simulation and analysis exercise.

The author confirmed that it was indeed a specific objective of the system that such witness statements would be taken, or cross-referenced to, using the data capture sheet under "SOURCE EVIDENCE".

Quite separately a second expert noted that "SOURCE EVIDENCE" should include draft witness statements, or cross-references. In his view there was a danger that early verbal interviews given by witnesses were open at a later stage to conflict, denial or simply being forgotten. He went on to propose that draft witness statements taken at this stage should be as detailed as possible, even suggesting recording and transcribing same.

**Objective No.3 IDENTIFY and SCHEDULE historic progress of the works for each programmed activity.**

This objective would be achieved **82%** of the time according to the expert panel.

It was generally noted that Contractors usually maintained sufficient internal records to allow the production of an "as-built" or historic record of a completed job.

It was observed however by one expert that an incomplete record should not in itself impede or prevent this system from progressing the preparation of a delay claim.

A separate comment was made that the system or approach did not clearly allocate the task of preparing an "as built" record to an individual as it was not embodied on the principal controlling document, namely the data capture sheet (Form Co.01)

The author acknowledged the last point and agrees that this should be reflected by an amendment in the approach.

**Objective No.4 IDENTIFY and TAG each causative event with the contractual/legal basis of the claim.**

The panel considered that this objective would be achieved on **92%** of occasions.

It was noted that much would depend on the quality of the consultant completing the data capture sheet, though one expert expressed the view that he was not sure that field investigations needed to be bogged down with this task. All were agreed it would eventually be done, and not later than when the Master Schedule of Delay was compiled.

**Objective No. 5 CONSTRUCT a computer based model of the**

**original construction programme with all the interdependent activities fully logically linked.**

For this objective the likelihood of achieving it successfully was 60%.

This objective, as with nos. 6 and 7, sat less comfortably with the legal expert as he considered it outside his field of expertise and consequently he passed on each question thus a zero score was recorded.

The Arbitrator acknowledged that whilst a computer based model would indeed be built, he would not necessarily accept that the logic employed was correct.

This last point is of obvious significance where the **CoSTAR** approach is to be employed in an adversarial dispute settlement process. Put simply if an opposing expert refuses or cannot agree to the Delay Impact Simulation approach then it remains for the Arbitrator to be persuaded, and places much reliance on his background, expertise and attitude to the use of critical path methods used in retrospective time delay analysis claims.

From the planning experts point of view it was noted that the model to be constructed should always, as a preference, use the Contractors own logic "warts and all". It is only where none is in existence that he will use his own expertise, combined with information gathered from the Contractor, to logically link all the activities in a Contractor's original programme in order that the delay impact simulation exercise can be performed.

**Objective No.6      INTERPRET the scheduled causative events in terms of localised construction programme constraints.**

This objective would be achieved 56% of the time.



As stated above, the legal expert chose to pass on this question, thus a zero was registered for his response. The Arbitrator again was of the view that the interpretation would not necessarily be correct.

The planners comment was more specific to the process in that he preferred the word localised to be replaced by "immediate downstream impact upon..". The point being to avoid confusion as to what localised meant.

A further concern was voiced by one of the other two experts that there must be careful consideration given as to who does this task and how it is done. Any risk of conflict between factual evidence being gathered and expert opinion evidence which might be called upon must be avoided.

**Objective No. 7      CALCULATE the critical delay effect of each alleged causative event resulting from the DELAY IMPACT SIMULATION exercise.**

The panel considered that this objective would be achieved on 54% of times.

Again this average percentage figure, the lowest of the 10, was principally affected by the legal and arbitration experts' score. In both cases the same comment as given for objective 6, applies.

The planning engineer considered the objective would be achieved commenting only that he would prefer that the exercise be retitled DELAY IMPACT ANALYSIS. His concern being that the expert is dealing with real time events and not "*what if*" scenarios.

One expert caveated his positive response "*subject to the quality of the critical path*" being used, and the degree of subjectivity inherent in the planners input. Another noted that whilst this objective was important he did not consider it should jeopardies the whole approach if it was not fully achieved. Provided

that all other activities were correctly executed, the claimant would still have the basis and factual evidence to support a claim for an extension of time.

Interestingly, this last point was to a degree echoed by the Arbitrator in that whilst he was considerably reluctant to simply accept critical delay periods produced by computerised calculation, he would of course fully and properly weigh up all other factual evidence put before him in support of a delay claim.

**Objective No. 8      CONSTRUCT an "As-Built" record tracking the historic progress of the works.**

For this objective the panel considered achievement would be reached on **90%** of occasions.

The author clarified for the experts that on most occasions the "as-built" record would almost certainly be in the form of a bar-chart.

Again whilst all experts agreed that a visual record would be a most useful presentation document, one expert commented that the whole process should not fail if all progress records are not available, and that the best should be made of the records that do exist.

**Objective No. 9      DESCRIBE in narrative format full particulars of each causative event of a critical delay, cross-referenced to the "master Schedule of Delay", the appended "Bundle of Documentary Evidence", and any other relevant source.**

The panel were almost fully agreed that this objective would be achieved giving a weighted score of **96%**.

Several comments were made further clarifying the experts' own views and stressing the importance of this objective.

From the planning expert. He requires as full as possible a description of a delay including additional relevant information such as potential parallel delays and opportunities presented for mitigating delays. This information is required particularly in order that he can fully test computed critical delays and show why they were critical, and not some other event.

A further comment made by one of the experts is set out as follows. *"A lot of weight is given to descriptive narrative, so the technical quality has to be superlative. It is often picked up and read by recipients (and their professional advisers) particularly lawyers and therefore the method in which the information is converted from schedule to narrative is critical.*

*"This is particularly important where cross examination might take place".*

*"The choice of wording is also important, it has to be factual and convincing whether being used as the basis for a commercial settlement, or for litigation or arbitration purposes".*

These views were very much echoed by the legal expert, particularly where acting in the role of an advocate. He confirmed that the narrative *"must be a good base document"*, which will facilitate the tasks of the construction lawyer.

**Objective No: 10    COLLATE    The analysis results and supporting evidence into a report style format to include:**

*"Introductory preambles, narrative text, schedules, charts, programmes, reports and copied documents"*

On this final item the panel were 100% agreed that this approach would fully achieve this objective.

There were no additional comments on this issue.

### 7.3.3 Additional Expert Commentary

During the course of the interviews several views were expressed by the experts that merit inclusion in this section because of their relevance to the new approach critique.

- **In favour of new approach**

Several of the experts expressed a positive enthusiasm for the overall approach with the planning expert suggesting it might be even more effective if it were used as a pro-active management tool at the outset of a project.

He based this view partly on his experience that Contractors do not all take sufficient care in the preparation of their construction programmes with the inevitable result that the critical path tends to *"hop, skip and jump"* all over the place.

This view was echoed by the legal expert.

All the experts endorsed the need to have a simple yet disciplined effective pro forma controlled method of gathering evidence for analysis and presentation, including the use of computing and information technology to assist in this sorting and processing activity.



- **Data Capture**

Both the legal expert and the planning engineer queried the matter of identifying the start and finish dates of a delay and evidencing same. The author briefly explained that the identification, if possible, of these parameters would assist concentrate the investigators focus on the real cause of a delay, and not simply apparent causes,

- **Computer Evidence**

The arbitration expert, pointed out that it was the area of computer evidence, "*how the computer calculated the periods of critical delay*", that he felt would present Arbitrators and Judges with the most difficulty.

This presents a dilemma to the extent that it would be impossible from a practical point of view to 'prove' with 'pencil, paper and calculator' the many hundreds of individual calculations that might be required to emulate the same tasks quickly executed by a computer using critical path project management software. And assuming that the construction programme is of sufficient size and complexity to warrant such computer aided analysis, a Tribunal will be tested as to how much weight they will give this evidence in the light of all other factual evidence provided.

On a positive note the Arbitrator did state that if this type of evidence is to be presented, the data input prior to the calculation will be closely scrutinised, and he emphasised that the planning analyst should be seen to reflect closely actual events occurring on site at the time at which he impacts the

delay and not simply rely on impacting progress alone.

This is very much a view echoed and detailed in 7.3.2 by the expert planner and why he views it as so important to be given as much detail surrounding a delay as possible.

It was also expressed by one of the other experts that under JCT Forms of Contract, a Contractor has a responsibility to pro-actively mitigate the effects of a delay, and not simply ignore it, or even try to benefit from it. The question must be put "*What did you do to mitigate the delay?*", and the responses reflected in the delay impact analysis.

- **Evidence**

The claims management expert emphasised the need to avoid a conflict between the planners opinion on delay effects, and that of factual evidence gathered, particularly from site staff. He suggested that the planning expert should endorse the evidence gathered at data capture stage. He emphasised that in his view the effect of a delay, reflected in the schedule of delay impacts should be fully justified on the basis of evidence gathered on data capture sheets, and indeed should be checked and reconciled prior to the Delay Impact Simulation exercise being undertaken.

The legal expert expressed the general view that any assessment claim application is only as strong as the evidence it supports, once again stressing the importance of the data capture process.



## 7.4 Conclusions

### 7.4.1 Summary and Conclusions

The validation process using experts from various relevant backgrounds achieved its purpose of testing the **CoSTAR** specification. **Figure 7.1** provides a snapshot illustration of the experts view on the likely success rate the system would have of achieving its objectives in a live situation.

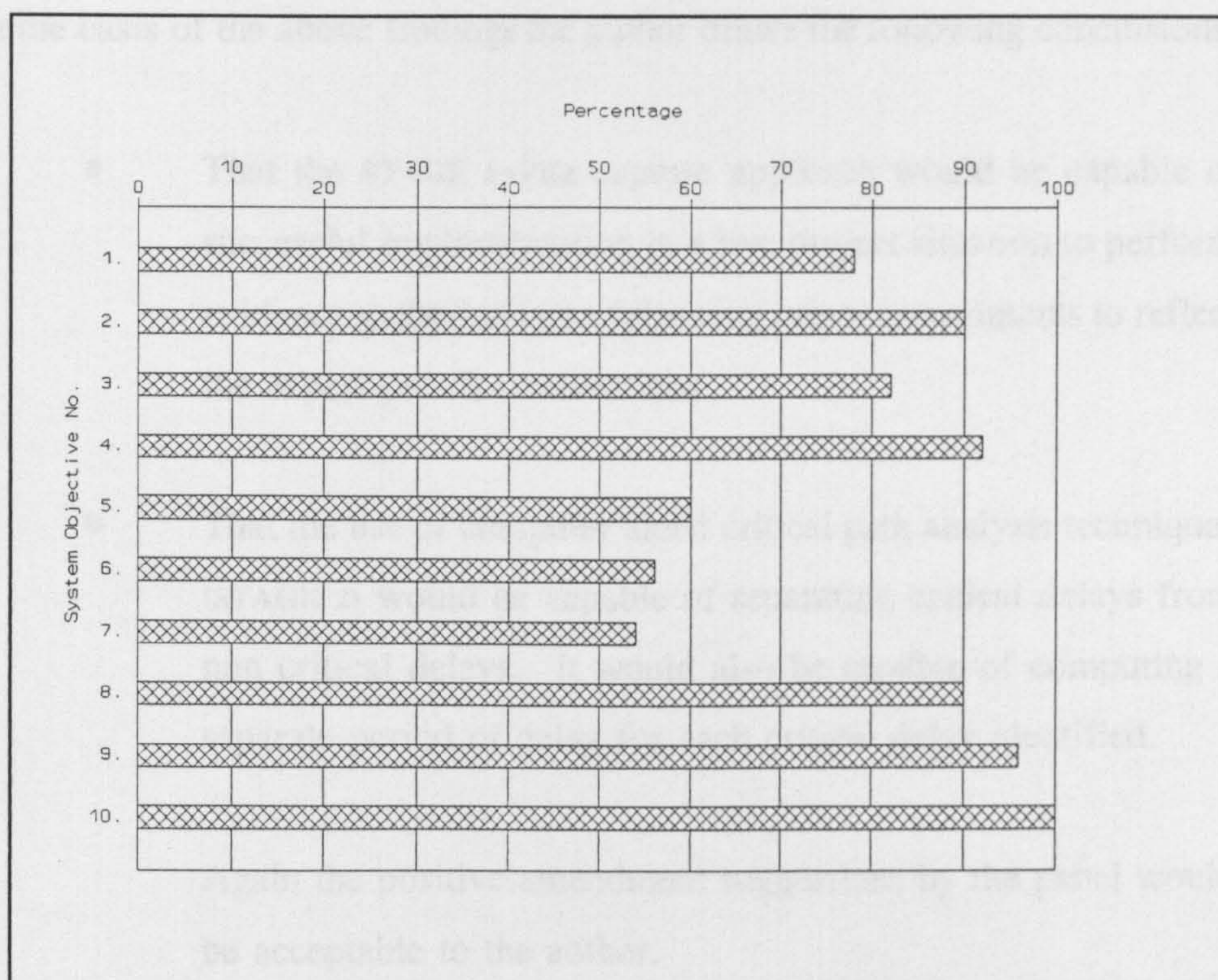


Figure 7.1 Experts response to each system objective.

It is clear from this brief review that objectives 1 to 4 dealing with the all important task of data capture were deemed to be largely realistically achievable, and the more traditional objectives of 8, 9 and 10 were even more highly rated.

It is the controversial area of computer generated evidence in objectives 5, 6 and 7 that the likelihood of achievement is noticeably reduced. This however



is somewhat unfortunately distorted by the legal expert passing on these questions, and the Arbitrator taking a strict view on what might happen in a pure adversarial situation.

It is encouraging however, according to **table 7.2** that notwithstanding the above, the approach taken as a whole secured an 80% average weighting indicating the panels high level of confidence in this approach.

On the basis of the above findings the author draws the following conclusions:

- That the **STAGE 1** data capture approach would be capable of successful implementation in a live project situation to perform evidence gathering tasks following minor amendments to reflect the expert panels observations.
- That the use of computer aided critical path analysis techniques (**STAGE 2**) would be capable of separating critical delays from non critical delays. It would also be capable of computing a separate period of delay for each critical delay identified.

Again the positive amendment suggestions by the panel would be acceptable to the author.

[It is noted that problems may exist where attempting to use this form of evidence in an arbitration or High Court Hearing.]

- The format for preparation of descriptive narratives to support Master Schedule of Delay findings (**STAGE 3**) are satisfactory for implementation.
- That **STAGE 4** achieved the compilation of the evidence into a clearly structured report style document capable of



implementation without further amendment.

<b>EXPERT PANEL</b>						
Objective No.	Planning Expert	Claims Management Expert	Construction Management Expert	Legal Expert	Arbitrator	Totals as a Percentage
1.	9	10	5	5	10	78
2.	9	10	9	7	10	90
3.	7	9	5	10	10	82
4.	9	10	9	8	10	92
5.	10	10	10	Pass	0	60
6.	10	8	10	Pass	0	56
7.	10	8	9	Pass	0	54
8.	10	10	5	10	10	90
9.	10	10	10	8	10	96
10.	10	10	10	10	10	100
Totals	94	95	82	58	70	Average 80

Table 7.2 Expert interview results

#### 7.4.2 The Next Stage

The next stage comprises the final part of the thesis whereby the conclusions and recommendations reached under the many chapter headings are gathered and summarised in **chapter 8**.

# CHAPTER EIGHT

## CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

---

---

- 8.1**            **Introduction**
  - 8.2**            **Conclusions**
    - 8.2.1           Literature Review - Theoretical Basis of Problems.
    - 8.2.2           Industrial Survey - Identification of Actual Problems.
    - 8.2.3           Evaluation of Findings.
    - 8.2.4           **CoSTAR** - Proposed New Approach to Time Delay Analysis.
    - 8.2.5           **CoSTAR** - Validation of the Proposed New Approach.
  - 8.3**            **Research Achievements**
  - 8.4**            **Hypothesis Review**
  - 8.5**            **Recommendations**
    - 8.5.1           To implement the proposed **CoSTAR** approach.
  - 8.6**            **Further Research**
- 
-

## CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

---

---

### 8.1 Introduction

This chapter concludes my work of research, drawing together the findings and/or conclusions of each chapter of the thesis into a composite whole. The essential purpose being to show whether the Hypothesis formed at the commencement of this research, and set out in chapter one was proved or otherwise.

The Hypothesis as stated is that :

*"If a computer-aided systematic approach is used to gather, model, analyse and evaluate project specific performance data, it will provide an improved and reliable basis for assessing the critical effect(s) of interference in a Contractors progress of construction works, and will identify essential evidence pertaining to the critical delay(s)."*

To support the above hypothesis, and enable the research work to progress logically with identifiable achievement targets, a series of "research objectives" was determined as follows :

- A. **Establish** the scope and frequency of time delay claims activity within the construction industry.
- B. **Determine** the level of effectiveness or otherwise of existing time

delay analysis methods employed by Contractors.

- C. **Identify** from theoretical and empirical evidence the shortcomings of existing approaches to time delay analysis and time extension claims.
- D. **Identify** from theoretical and empirical evidence the essential features of an effective time delay analysis system for use in claims assessment preparation.
- E. **Devise** a solution for improving the preparation, time delay analysis and presentation of Contractors extension of time claims.
- F. **Contribute** to an improved understanding of time delay analysis and extension of time assessment preparation.
- G. **Draw** conclusions on research and development work undertaken and identify scope for future research.

Later in this chapter research findings and achievements will be linked, or matched, to the above objectives to demonstrate that they were all successfully accomplished.

The Thesis is structured into 8 chapters, **chapters two and three** containing captured and analysed data and **chapters four, five and six** containing reports of further research activity taken in response to the findings of **chapters two and three**. **Chapter seven** contains the findings of the expert validation procedure.

This chapter sets out in the penultimate section a number of recommendations based on conclusions drawn from the research findings, and finally lists several areas arising out of this research which would form the basis of further separate research.



## 8.2 Conclusions

### 8.2.1 Literature review - Theoretical Basis of Problems

Firstly the findings of the literature review will be considered. This exercise was conducted to find out what was or had been written on the research topic, and to establish the theoretical basis of problems.

The author discovered that a considerable amount had been written on aspects of claims management, mainly focusing on contractual and cost quantification matters, but less on analytical methodology in the approach to time delay analysis/time extension assessment, and very little on computerising such approaches.

The literature review revealed that construction claims activity does exist, that claims are common, are on the increase, and that time extension requests are amongst the most frequent made. (The source evidence for these conclusions is contained in the body of **chapter two**, including the results of a recent survey amongst lawyers revealing a 12% rise in construction case work and a 9% forecast for future growth in this area).

Following a full analysis of all the data gathered during the literature search, a significant number of problematic areas were identified principally in connection with the method in which potential claim supporting evidence is stored, gathered, analysed, evaluated and presented.

It was broadly concluded that Contractors lack comprehensive understanding of the basis of time delay claims. They also suffer a significant degree of record management failure which results in claims being ill prepared, poorly substantiated and weakly presented.

The fact that all contractual claims must be founded in law, that the onus of proof

rests on the claimant and that it is no longer an acceptable excuse to fail to maintain proper records or conduct effective analysis of same in preparation of a claim, appears to be ignored by claims managers in the industry.

On the subject of records it was found however that in view of the enormous quantity of recorded data generated by medium to large construction projects it would be almost impossible, and certainly not cost effective to keep a 100% record of a job. Consequently a careful balance has to be maintained when selecting essential information for recording.

Turning to the matter of **causation**, this addresses much more specifically the validity of a claim, which is of significant importance in time extension claims.

It was found that claims fail because causality was not shown. Causality is the relationship of cause and effect and it was observed that failure to provide evidential linkage proves fatal to a time extension claim.

Finally, I observed that evidence in support of claimed assessments, was deficient for reasons,(other than those cited above), which included incomplete documentation, poor or confused assertions, unwieldy and poorly bound documentation, poor or none existent cross referencing, and charts, if used at all, which were badly conceived or misleading.

### **8.2.2 Industrial Survey - Identification of Actual Problems**

The response rate of **50.1%** to the postal questionnaire survey together with the senior ranking<sup>1</sup> of individuals within the companies who responded to the survey on behalf of their organisation led me to conclude that this topic is of significant interest to the construction industry.

<sup>1</sup> Half the individuals who identified their position were Directors or Chairmen.

The survey was targeted at the British Construction Industry and mainly limited to work undertaken using JCT Contract forms.

Following careful analysis of the data gathered in the survey, and the findings reached, the following main conclusions were drawn:-

- **There is a very high incidence of time extension claims being made by British Contractors (84% of sample surveyed), with an equally high dissatisfaction rate, (some 83% amongst the same Contractors surveyed), with the subsequent awards they receive (if any).**
- **A significant number (17%) of Contractors are prepared to seek resolution of their claims through the arbitral or High Court process.**
- **A third of the Contractors surveyed had claims for time extensions rejected because of their failure to demonstrate clearly the essential link between the cause and effect of a critical delay.**
- **Infrequent usage of sophisticated planning techniques combined with low usage of computing and information technology contributes significantly to the failure to properly demonstrate causality in time extension claims, consequently leading to claim rejection. This conclusion is based on the observation that of the sample surveyed, only 15% used the technology for preparing their construction programmes.**
- **Contractors attempt to circumvent necessary time delay analysis by promoting and presenting global claims which in turn lead to rejection. It was observed that 20% of the sample had claims rejected because they were too *"global"*.**

- **A large percentage, (49%) of Contractors surveyed, fail to invest and enjoy the benefit of computing technology on site locations.**
- **Failure to use IT to generate, maintain and store essential job specific records, (less than 20% of the Contractors surveyed use IT in this way), leads to failure when gathering data to analyse and present in claims situations.**

### **8.2.3 Evaluation of Findings**

When the results of the literature review were contrasted with the findings of the industrial survey it was observed that the empirical data gathered, identified problematic areas found as having a theoretical basis, and led to the following conclusion:

*"The methodology and resources employed by Contractors to store, gather, analyse evaluate and present data as evidence in the format of time extension claim assessments suggested there was need for significant improvement, particularly by the implementation of computerised or computer aided systems".*

The above shortcomings were formulated into a problem with a solution proposed as follows:

*"The research, analysis, evaluation and assessment of extension of time claims is formulated as a problem whose solution is a new approach which eliminates the deficiencies of the traditional approach".*

Following a systems analysis exercise of the claim cycle, (reference table 2.1)



including the formulation of ideal criteria standards, a co-ordinated systematic approach comprising all the essential stages for claims preparation from initial research through to the claims assessment submission was devised.

The solution or new approach takes the form of a **Computer-aided System for Time Analysis Review, abbreviated to CoSTAR.**

#### **8.2.4 CoSTAR - Proposed New Approach to Time Delay Analysis**

The new approach, comprising of a system specification, whilst similar to the traditional approach in terms of data research, analysis, evaluation and presentation of findings in connection with critical delay claim assessments, places considerable emphasis on clearly establishing **relevant facts.** Also all source documentation upon which calculations, computations, assumptions and deductions are based is sorted and presented in such format that it is capable of, and open to, **full inspection and verification.**

The principal difference between the proposed and the traditional approach turns on the fact that the **new approach places greater emphasis on integrating all the various parts of an assessment process into a computer-aided system.**

In addition **CoSTAR specifically addresses the critical interface between data capture and computer aided delay impact simulation,** which in itself is a departure from the traditional methods. It also deals with the matter of Contractors inefficiencies contributing to or causing critical delays.

A detailed system specification of **CoSTAR,** including a flowchart, controlling forms and tables, is set out in **chapter five.**

In order to assess whether **CoSTAR** would work effectively it was necessary to test and validate the new system. Accordingly a set of "*system objectives*" was developed from the formulated initial criteria standard requirements, against which

the CoSTAR approach could be measured.

### 8.2.5 CoSTAR - Validation of the Proposed New Approach

The assessment of the new approach was conducted in 2 parts. The first comprised a trial run by the author of a prototype in a "real life" project situation. The performance of CoSTAR was fully evaluated and reported upon in chapter six.

The overall result was that the CoSTAR Approach proved capable of successful implementation in a live contract situation, that it was workable, expedient and cost effective in producing calculated assessment results by effectively blending a conceptual technological approach using industry standard business computer software with traditional assessment methodology.

**The Approach achieved all the system objectives set out prior to the implementation and which are shown in table 6.1.**

The trial run uncovered a number of problematic areas inherent within the Contractors own sphere of operational influence, and within the CoSTAR approach (reference 6.5). Recommendations for amendment and/or alteration to improve both the Contractors construction management processes and the CoSTAR Approach were formulated and detailed in section 6.5.4 and later in section 8.3.

#### ADDENDUM :

However for ease of reference those shortcomings and limitations pertaining to the CoSTAR approach are set out briefly in the following :

- (1) Where the CoSTAR system is deployed on an historical basis for forensic analysis, a significant reliance will be placed upon the quality of the source evidence data as to the effectiveness of CoSTAR. Where data capture is negatively affected by *"inadequate, incomplete, or missing records"* and/or *"difficulties of retrieving data"* is experienced, then this will have a limiting effect on the CoSTAR process.

This manifests itself as *incomplete data capture sheets*, which in turn affects the *"integrity of both the Schedule of Delay Impacts"* and *"Schedule of Delay"*.

There is little to be done where source data does not exist, or is so impaired. However in such circumstances the CoSTAR system would have a beneficial role to play in that it would highlight at a very early stage the potentially serious weakness in the likely success or otherwise of a case, and thus saving expanding considerable sums of money unnecessarily.

Obviously where the CoSTAR system is employed at the preliminary stage to a project such potential difficulties can be eliminated entirely.

- (2) At second limitation to the new system, again occurring when CoSTAR is used on a historical basis, is the inability to rely fully on weak witness evidence from individuals involved in a project.

Again this can be simply rectified by a mandatory the requirement for key staff to maintain contemporaneous records

- (3) The CoSTAR system is (not yet) a fully automated process and as such could suffer from incorrect usage.
- (4) The system still relies on human judgemental decisions from time to time with all the possibility for error that creates.
- (5) The computer-aided analysis part of the system is still treated with suspicion by lawyers and arbitrators alike, and is open to abuse in a formal procedure.

It is worth noting from a future research perspective that the CoSTAR system does not address disruption directly. It should also be noted that CoSTAR is a system specification only.

The second part of the validation process comprised the selection and interview of experts who assessed the system, using their own professional background and knowledge, against the system objectives set, and provided their view on whether these criteria would be met. Five experts of appropriate experience were contacted and interviews arranged. The selection criteria and results are reported in detail in chapter seven.

In summary the experts were on the whole in favour and supportive of such an integrated systematic approach to gathering, sorting, analysing and presenting evidential data in support of a time extension claim.

The responses they gave to the structured questionnaire (which sets out the system objectives in the form of 10 weighted questions) returned an overall score that this approach would be 80% successful in a "live" project situation.

Whilst the experts generally were satisfied with the all important data capture stage, and even more accepting of the evidential packaging and presentation stage, it was the computer-aided critical path analysis and calculations, or "computer evidence" that caused some difficulties, particularly to the legal and arbitration experts.

However, a lot of useful comment was generated by probing these difficulties with the result that providing certain principles were observed, the problems arising were by no means fatal to the system, and could be resolved.

The author therefore drew the conclusion from these findings that the new approach, CoSTAR, taken as a whole, would be capable of successful implementation in a "live" project situation, would generate the output required, and could be used both for the commercial settlement of claims, or if necessary could contribute to the settlement of disputes through arbitration or litigation proceedings. The system could also be used as a proactive management tool at the outset of a project to gather necessary evidence and contribute to positive mitigation action.

### 8.3 Research Achievements

Section 8.2 broadly summarises the conclusions drawn from **chapters two to seven** of the thesis. This section reviews the "*research objectives*" as set out in section 8.1 and describes how these were achieved including cross-reference to the relevant chapter detail.

**Objective A. Establish the scope and frequency of time delay claims activity within the construction industry.**

This objective was satisfied by the following achievements :

**(1) Established that claims activity is endemic in the construction industry, and that it is forecast to grow.**

12% of lawyers surveyed in 1993 reported a rise in construction work case load, and 9% forecast further growth in this area.

**(2) Established that there is a high incidence of contractors claims for time extensions.**

84% of Contractors had recently submitted an extension of time claim.

32% of Contractors had submitted a claim on 1 in 2 jobs.

In addition the contents of **chapter two and three** fully met the requirements of this objective.

**Objective B. Determine the level of effectiveness or otherwise of existing time delay analysis methods employed by Contractors.**

This objective was satisfied by the following achievements :



- (3) **Established that there is a high rate of dissatisfaction amongst Contractors with time extension awards being granted.**

**83%** of Contractors were dissatisfied on one or more occasions.

**31%** of Contractors were dissatisfied on 1 out of every 2 jobs.

This was partly due to claims being rejected for the following main reasons:

- failure to establish causal link
- insufficient supporting documentation.
- claim too "global".
- written notice deficiencies.

These were in turn caused by:

- Poor information and record management resulting in deficient data suitable for analysis and presentation as evidence in support of a claim.
- Failure to use sophisticated planning techniques and computing technology to prepare and monitor project programmes, which could be analysed and presented as supporting evidence in time extension claims, which was shown by the following facts :

**49%** of Contractors **do not** use computers on site.

**36%** of Contractors never use "*Critical Path Analysis*" or computers to generate computer programmes.

**35%** of Contractors never use "*Critical Path Analysis*" to analysis time delay in preparation for claims.

- Failure to resource and implement claims management

systems to monitor and screen problems as they arise and ensure that contractual requirements, ie. written notices, are timeously submitted and recorded.

**Chapters two to four inclusive** provide full supporting evidence that the above objective was satisfied, particularly in the industrial survey.

**Objective C. Identify** from theoretical and empirical evidence the shortcomings of existing approaches to time delay analysis and time extension claims.

This objective was satisfied by the following achievement :

**(4) Identified significant short comings in the existing approaches to time delay analysis** of construction project overruns, both from the theoretical and practical perspectives and these were fully described in **chapters two, three and four.**

**Objective D. Identify** from theoretical and empirical evidence the essential features of an effective time delay analysis system for use in claims assessment preparation.

This objective was satisfied by the following achievement :

**(5) Identified from theory and practice the essential criteria for an effective time delay analysis system** set out in **chapters four and five** from which the **CoSTAR** system was developed.

**Objective E. Devise** a solution for improving the preparation, time delay analysis and presentation of Contractors extension of time claims.

This objective was satisfied by the following achievements :

- (6) **Identified a computer aided systematic basis for achieving effective time delay analysis and overcoming the problems stated in (3) above, and the shortcomings referred to in (4) above.**
- (7) **Proposed an effective time delay analysis approach by formulating the time delay analysis process of contract period overruns as a computer-aided system, to achieve improved accuracy in identifying causes of critical delay and quantifying their effects.**
- (8) **Devised an effective approach, CoSTAR, for analysing time delays on construction projects based on commonly available personal computer hardware and software.**

**Chapter five** meets this objective in full and describes the new **CoSTAR** system for time delay analysis representation of Contractors extension of time claims. **Chapters six and seven** deal with testing and validation of the new system specification which, as stated in the final paragraph of section 8.2.5 would be capable of "*successful implementation in a live project situation.*"

**Objective F. Contribute to an improved understanding of time delay analysis and extension of time assessment preparation.**

This objective was met generally by the whole thesis, in particular the test work undertaken in **chapter six**, and by the findings resulting from achieving objectives C, D, and E.

**Objective G. Draw conclusions on research and development work undertaken and identify scope for future research.**

This objective was satisfied by the following achievement :

- (10) **Identified areas in which further research is needed** in order to enhance the above achievements and further the stated objectives of the research. These are contained fully within the text of **chapter eight**.

The achievements referred to in numbers (1) to (10) above are summarised in section 1.5 of **chapter one**.

#### **8.4 Hypothesis Review**

The author concludes, on the basis of the research findings set out in the foregoing, that the research hypothesis was achieved.

The general justification for this conclusion is that an effective and successful systematic approach to the analysis, assessment and presentation of time extension claims has been developed as a direct result of this research work. This, followed initial identification that whilst time delay claims are a frequent, and apparently integral, part of construction industry practice, they, have to date, been failing at an unacceptably high level to achieve their objective, all of which has been described elsewhere in this thesis.

More specifically, justification that the hypothesis has been achieved is provided by breaking it down into its 4 main constituent parts, and cross-referencing the achievement to the thesis.

Taking each part as follows :

*"If a computer-aided systematic approach is used..."*

The **CoSTAR** approach is exactly this, in that the entire claim process has been analysed and a system specification devised which is automated in part by the assistance of computing technology. Refer to **chapters five,six**



and seven for full details.

*"...to gather, model, analyse and evaluate project specific performance data,..."*

Again this part of the hypothesis has been achieved as described in **chapter five**, and in particular summarised within the flowchart reference figure 5.1.

*"...it will provide an improved and reliable basis for assessing the critical effect(s) of interference in a Contractors progress of construction works,..."*

The achievement of this part of the hypothesis was fully proved through the validation procedures as fully detailed in **chapters six and seven**.

*"...and will identify essential evidence pertaining to the critical delay(s)."*

This final part of the thesis is shown to be achievable by the work described in **chapters five and six**.

Having shown that the four sub-sets of the hypothesis have been achieved by the work undertaken, it therefore follows that the hypothesis as a whole has been proven.

This means it has been clearly demonstrated, that by using a computer-aided claims management system, it is possible to improve the collection and recording of data for claims. It will also improve the reliability of assessing the critical effects on a Contractors construction work progress. These improvements will in turn lead to a more reliable way of identifying and presenting the essential evidence required in relation to critical time delays on construction projects.

## **8.5 Recommendations**

The thesis developed as a result of this research leads the author to make the following recommendations:

### **8.5.1 To implement the proposed CoSTAR Approach**

To achieve effective implementation of the **CoSTAR approach to time extension claim preparation as proposed in this thesis Contractors would need to:**

- (1) Review fully their **information management systems**. The quality of data captured for the **CoSTAR** approach places significant reliance upon the methodology employed by the Contractor to store, manage and control information.

Contractors would need to devise and implement a workable computerised data base system with a common core of information readily accessible to authorised individuals through an **efficient** retrieval system.

The above would in addition accentuate the benefits of using the **CoSTAR** approach through **improving the quality** of data captured, and **considerably speeding up the interrogation process** (for example by allowing the use of computerised data sort and query tools).

- (2) Introduce an **automated data capture system** to remove the requirements to rely upon the weakness of human memory of site personnel. Key site staff would be required to maintain a daily log.

The above would ensure an improved quality in capturing **factual data**.

## **8.6 Further Research**

- This research thesis broadly concentrated on problems arising under claims management process eventually focusing specifically on the problem of analysing critical time delays for extension of time assessment claims.

In the process there were identified several other areas of claims management that would benefit from research, **in particular the analysis, evaluation and presentation of disruption claims.**

- A significant area requiring academic investigation is the whole process of how Contractors manage and control information in particular job specific records and data. Consider the idea of a fully integrated project library using IT being maintained from site.
- The **CoSTAR** approach is a system specification. The next stage would be to devise a fully integrated computerised system.

## LIST OF APPENDICES

---

---

Appendix A	Bibliography
Appendix B	(Not used)
Appendix C	(Not used)
Appendix D	Questionnaire cover letter
Appendix E	Questionnaire
Appendix F	Database
Appendix G	Schedule of Additional Information
Appendix H	Schedule of Statistical Results
Appendix I	Experts briefing letter
Appendix J	Experts Validation Questionnaire

---

---



# **APPENDIX A**

## **Bibliography**

## BIBLIOGRAPHY

### *Book Publications :*

- Adrian, J.J.**, 1988. Construction Claims - A Quantitative Approach, chapters 1 and 2.
- Armstrong, W.E.L.**, 1987 (3rd edition). Contractual Claims under the I.C.E. Conditions of Contract. ISBN 0 906600 17 0
- Ashworth, A.**, Contractual Procedures in the Construction Industry.
- Audas, J.M.**, 1983. Extensions of Time - Volume I.
- Audas, J.M.**, 1985. Extensions of Time - Volume II.
- Bramble, B.B., Callahan, M.T.**, 1992(2nd edition). Construction Delay Claims. ISBN 0 471 54518 x. ✓
- Burns, A., (General editor)**, 1989. Construction Disputes - Liability and the Expert Witness. ISBN 0 406 11101 4.
- Carmichael, D.G.**, 1989. Construction Engineering Networks, Techniques...
- Carter, R.**, 1990. Using dBase IV.
- Chappell, D.M.**, 1984. Contractors Claims.
- Chilvers, D., Lemar, C.**, 1988. Litigation Support & Financial Assessment of Damages. ISBN 0 406 50402 4.
- Cooke, B.**, Construction Planning and Contract Procedures.
- Coombes Davies, M.**, 1989. Avoiding Claims - A practical guide for the construction industry. ISBN 0 419 143620 2.
- Cormican, D.**, 1985. Construction Management - Planning and Finance.
- Cowell, P.**, 1988. Arbitration in Building Disputes.
- Creswell, W.T.**, 1952. Law relating to Building and Civil Engineering Contracts.
- Dennis, G., (Editor)**, 1989. Annual Abstract of Statistics.
- Forinton, M.**, 1972. Civil Engineering Contract Claims.
- Franks, J.**, 1987. Making Small Claims in the County Court.
- Franks, J.**, 1986. Building Subcontractors.
- Gilbreath, R.**, Managing Construction Contracts, Op Contracts...
- Goodacre, P.E.**, 1990 (2nd edition). Delays and Disruptions in Construction, Ascertainning the Cost. ✓

- Goodchild, G., 1989.** Arbitration, A Practical Guide for Quantity Surveyors.
- Greenstreet, B., 1981.** Legal & Contractual Procedures for Architects.
- Harlow, P.J., 1989.** Contractual Claims - An Annotated Bibliography. ISBN 1 85380 009 0.
- Harris, F., McCaffer, R., 1984.** Modern Construction Management. ISBN 0 00 383198 1
- Hellard, R.B., 1988.** Managing Construction Conflict..
- Hudson, A.,** Building and Civil Engineering Contracts.
- Hughes, G.A., 1985 (2nd edition).** Building and Civil Engineering Claims in Perspective, chapter 6, pp 115-145.
- Hughes, G.A., 1981 (2nd edition).** The Anatomy of Quantity Surveying, chapter 2.7, pp 135-176.
- Keating, D., 1991 (5th edition).** Keating on Building Contracts.
- Keating, D., 1963 (2nd edition).** Law and Practice of Building Contracts.
- Knowles, J.R., 1991.** Construction Claims - Preparation Using Computers.
- Knowles, J.R., 1989.** Claims - Their Mysteries Unravalled.
- MacMillan, S.K., 1982.** A Critical Examination of Arbitration as a.....
- Major, W.T., 1980.** Building and Civil Engineering Clams.
- Manson, K., 1983.** Construction Case Law in the Office.
- Marks, R.J., & R.J.E., Jackson, R.E., (1985 3rd edition).** Aspects of Civil Engineering Contract Procedure. ISBN 0 08 031637 9.
- Merton, P., 1983.** Commercial Claimsmanship, specific references to FIDIC.
- Morley, S.,** Victory on "Site".
- Neale, R.H., & D.E., 1989.** Construction Planning. ISBN 0 7277 1322 1.
- Parris, J., 1982.** The Standard Form of Building Contract 1980. ISBN 0 246 11633 1.
- Powell-Smith, V., Furmiston, 1990 (2nd edition).** A Building Contract Casebook.
- Powell-Smith, V., Simms, J., 1988 (2nd edition).** Building Contract Claims, chapter 2, pp 19-80. ISBN : 0 632 02079 2.
- Powell-Smith, V., Stephenson, 1989.** Civil Engineering Claims.
- Powell-Smith, V., 1989.** Some Building Contract Problems, chapter 5, pp 92-114., chapter 7, pp 137- 158. ISBN : 0 632 02581 6.
- Powell-Smith, V., 1985.** Determination and Suspension of Construction Contracts.
- Reynolds, M.P., King, P.S.D., 1988.** The Expert Witness and His Evidence. ISBN 0 632 01854 2.

- Robinson, T.H.**, Establishing the Validity of Contractual Claims.
- Scott, K.**, 1992. The Management of Contractual Claims. ISBN 1 85380 045 7
- Simon, M.**, 1979. Construction Contracts and Claims.
- Thomas, W.R.**, 1993. Construction Contract Claims. ISBN 0 333 55498 1.
- Trickey, G.**, 1983. The Presentation and Settlement of Contractors' Claims, chapter 8, pp 229-257. ISBN 0 419 11430 0.
- Turner, D.**, Building Subcontract Forms, chapter 5, pp 9-124. ISBN 0 00 383015 2.
- Turner, D.**, 1989. Building Contract Disputes. Their Avoidance and Resolution. ISBN 0 582 03734 4.
- Uff, J.**, Construction Law. law and Practice Relating to the Construction Industry.
- Uprichard, D.C.**, 1986. Computerised Standard networks in the Construction Industry.
- Ward, P.A.**, 1979. Organisation and Procedures in the Construction Industry.
- Watts & Partners**, 1991. Building Cases 1991.
- Wood, R.D.**, 1986. Contractors Claims under the JCT Agreement for Minor Building Works (1980). ISBN 0 906600 82 0.
- Wood, R.D.**, 1978 (2nd edition). Building and Civil Engineering Claims, pp 348-355.
- Wood, R.D.**, 1988. Contractors Claims Under JCT 1980. ISBN 1 85380 001 5.
- Wood, R.D.**, 1986. Contractors' claims under the GC/Works/1 - Edition 2 form of contract (2nd 3 revised edition). ISBN 0 906600 85 35.
- Wreghitt, J.D., Audas, M.**, 1988 (2nd edition). Extensions of Time. ISBN 1 85380 003 1. ✓

*Official Publications :*

**British Standards Institution**, 1987. British Standard 4335 : 1987 (prev. 1972). Glossary of Terms used in Project Network Techniques.

**Department of the Environment (DoE)**, Statistics - Building and Construction.

*Reports :*

**Reading University**, UK and US Construction Industries. Comparison Des.....

*Journal Papers :*

**Arditi, D., Patel, B.K.**, "Expert System for Claims Management in Construction Projects", *International Journal of Project Management*, Vol. 17,, No. 3, August 1989, pp 141-146.

**Atkin, B.**, "Managing with Computers", *Chartered Quantity Surveyor*, June 1988, pp 15-16.



- Atkin, B., "Information Management Comes of Age", *New Builder*, 26 April 1990, p 17.
- Beard, D., & V.E., "Up Gearing - Market Report", *New Builder*, 28 May 1992.
- Brewer, G.R., "No End to Conflict", *Contracts Journal*, 2 September 1992
- Brewer, G.R., "Practical guidelines for the extension of work time", *Construction Weekly*, 13 May 1992, p16.
- Carrick, D., "Networks and the 'what if' scenario", *Civil Engineering Surveyor*, October 1989, pp 4-6.
- Carrick, D., "Subcontractors Programmes", *JRK Newsletter No.4.*, Autumn 1989, p 3.
- Carrick, D., "Computer Claims Part 2", *JRK Newsletter No. 6.*, 1990, p 3.
- Carrick, D., "BoQ's and networks can co-exist", *Civil Engineering Surveyor*, September 1991, pp 25-26.
- Carter, M.J., "Building without conflict conference was a fiasco", letter in *Construction Weekly*, 8 January 1992, p 20.
- Cree, C., Barnes, M., "Quantifying Disruption Costs", *Construction Law Journal*, 1990, pp 258-263.
- Currie, O.A., "Avoiding, Managing, and Winning Construction Disputes", *Construction Law Review*, 1991, pp 344-369.
- Diekmann, J.E., Tabtabai, H.A.I., "Knowledge Based Approach to Construction Project Control", *International Journal of Project Management*, Vol 10, No. 1, February 1992, pp 23-30.
- Galloway, P.D., Nielsen, K.R., "Concurrent Schedule Delay in International Contracts", *The International Construction Law Review*, 1990, pp 386-401. This paper is based on part of a paper entitled "Schedule Delay Concurrency Issue Analysis & Proof", presented at the 11th Cost Engineering Congress held in Paris from April 22-25, 1990.
- Haksever, A.M., "Contractors Come of Age", *Construction Computing Software Guide*, Spring 1992, pp 23-24.
- Hosie, J., "Global Claims", *Civil Engineering Surveyor*, March 1992, pp 17-18.
- Hunt, G., "Tools of the trade", *Chartered Quantity Surveyor*, June 1988, p 14.
- Hunt, G., "Making Progress", *Chartered Quantity Surveyor*, November 1987, p 13.
- Huws, U., "Uprooting the Office", *Practical Computing*, September 1988, pp 38-48.
- Jarret, M., "The second wave", *Chartered Quantity Surveyor*, December 1987, p 9.
- Jarret, M., "Taking the plunge", *Chartered Quantity Surveyor*, July 1987, p 10.
- Keane, P.J., "Extensions of Time", *Chartered Quantity Surveyor*, August 1988, p 13.
- Keane, P.J., "Extensions of Time - 2", *Chartered Quantity Surveyor*, September 1988, p 32.

- Khaled, B.B., Manzanera, I.,** "Claim management", *Project Management*, Vol. 8, No. 4, November 1990, pp 222-228.
- Langford, D.,** "America Claims", *Building*, 8 April 1983, pp 52-53.
- Levy, C.,** "An expert left out in the cold", *Computing*, 23 February 1989, p 26.
- Lloyd, H.,** "Time 'at large' does not lead to Riches", *Building*, April 1992, p 30.
- MacPherson, S.,** "Shared vision", *Building*, 31 March 1991, p 59.
- Marsh, P.D.V.,** "Negotiating Skills in Construction Disputes (1)", *Construction Law*, 1991, pp 219- 221.
- Mastandrea, F.,** "Concurrent delays : several solutions", Letter in *Building*, 16 April 1992, p 25.
- Mastandrea, F.,** "A crucial issue", Letter in *Chartered Quantity Surveyor*, April 1992.
- McKnight, G.,** "How Best to take on the Big Boys", *Project Scotland*, April 1992.
- Morris, M.,** "Good Planning is the Key", *Chartered Builder*, December 1990, pp 17-19.
- O'Cock, M.,** "Project Programmes - Necessity or Smokescreen?", *Project*, April 1991, pp 26-28.
- Roulston,** "Claims Avoidance in Building and Civil Engineering Contracts (2)", *Constructional Law*, pp 249-251.
- Scott, S.,** "Keeping Better Site Records", *Project Management*, Vol. 8, No. 4, November 1990, pp 243-249.
- Stokdyk, J.,** "Beyond the critical path", *Building*, 10 February 1989, pp 72-73.
- Thomas, M.,** "Dispute Resolution", *The Journal of the Chartered Institute of Arbitrators*, February 1991, pp 9-13.
- Wager, D.,** "Scanner in the works", *Building*, 27 September 1991, pp 60-61.
- Worby, G., Tyler, A.H., Harris, F.C.,** "Management of Claims", *Building Technology and Management*, 7 August 1985, pp 23-24.
- (Editorial),** "Construction litigation on the increase", *Chartered Quantity Surveyor*, September 1991, p 5.
- (Unattributed),** "Making Things Hum", *New Builder*, 19 March 1992.
- (Unattributed),** "Tarmac starts Total Build", *Construction News*, 16 May 1991.

## **APPENDIX B**

**Not Used**

## **APPENDIX C**

**Not used**



## **APPENDIX D**

### **Questionnaire cover letter**

**P J Keane** MSc.,FCIOB.,ACI Arb

[ PJK Address ]

Reference: PJK\\quest-lt.001

[NAME]  
[COMPANY]  
[ADDRESS]

[DATE]

Dear [NAME]

**RESEARCH SURVEY - LOUGHBOROUGH UNIVERSITY  
TOPIC - COMPUTERS AND CLAIMS MANAGEMENT**

I am currently undertaking a project at Loughborough University researching the use of **computerisation in claims management** and the **benefits** this would bring to the Construction Industry as a whole.

I need approximately **15 minutes** of your time to answer the enclosed questionnaire which can then be returned in the pre-paid envelope.

Should you wish to learn more of the research project, please do not hesitate to contact me.

Thankyou in anticipation of your time and assistance.

Yours sincerely

**P J Keane**  
Research Student

Encs

# **APPENDIX E**

## **Questionnaire**

# SURVEY

on

## COMPUTER USAGE

in

## CONSTRUCTION CLAIMS MANAGEMENT

["Place a tick in the box or write a description"]

### BACKGROUND

Q1. Which category best describes your organisation?

- |                 |     |
|-----------------|-----|
| Main Contractor | [ ] |
| Sub contractor  | [ ] |
| Other .....     | [ ] |

Q2. Indicate the main geographic location of the companies business activity

- |                                         |     |
|-----------------------------------------|-----|
| Local (50 mile radius)                  | [ ] |
| Regional (restricted to part of the UK) | [ ] |
| National (throughout the UK)            | [ ] |

Q3. What was the companies turnover in the last financial year?

(£m)

- |        |     |
|--------|-----|
| 0-50   | [ ] |
| 50-100 | [ ] |
| 100+   | [ ] |



---

**CONTRACTUAL AND CLAIMS MANAGEMENT**

**Q4. What is the frequency with which, during the past 2 years, you have been required to execute works under any of the JCT (Joint Contracts Tribunal) standard forms of building contract?**

Over 75% [ ]

Over 50% [ ]

Over 25% [ ]

Less than 25% [ ]

Not at all [ ]

**Q5. Where work has been undertaken under JCT forms of contract, how often has the need arisen to submit extension of time claims?**

Over 75% [ ]

Over 50% [ ]

Over 25% [ ]

Less than 25% [ ]

Not at all [ ]

**Q6. Where claims are submitted for an extension of time under the JCT forms, on how many occasions has an award been made which has been deemed satisfactory?**

100% [ ]

Over 75% [ ]

Over 50% [ ]

Over 25% [ ]

Less than 25% [ ]

Not at all [ ]

**Q7. In the year ending December 1992 has it been necessary to commence arbitration or litigation proceedings on any job covered by a JCT contract?**

Yes [ ]

No [ ]

**Q8. If so, on how many occasions?**

1 - 3 [ ]

4 - 6 [ ]

7 - 9 [ ]

10 plus [ ]

**Q9. Does your company directly employ individuals assigned solely to working on, and/or advising in connection with contractual time and money claims?**

Yes [ ]

No [ ]

**Q10. Does the company employ external consultants to work on, and/or advise in connection with contractual time and money claim?**

Yes [ ]

No [ ]

**COMPUTING TECHNOLOGY**

**Q11. Are computers used by the company on construction site locations?**

- On over 75% of sites [ ]
- On over 50% of sites [ ]
- On over 25% of sites [ ]
- On less than 25% of sites [ ]
- Not at all [ ]

**Q12. Where computers are used on site locations, please indicate the tasks they perform:**

- Word Processing [ ]
- Contract Programming [ ]
- Progress Monitoring [ ]
- Instruction Register [ ]
- Drawing Register [ ]
- Cost Management [ ]
- Cost Value Reconciliation [ ]
- Labour Records [ ]
- Material Records [ ]
- Plant Records [ ]
- Other (please specify) [ ]
- ..... [ ]
- ..... [ ]

**Q13. If it were possible to improve the companies success rate in claim settlement using computerisation, would you be more in favour, or less in favour, of investing in this technology?**

- More in favour
- Less in favour
- Neither

**Q14. Indicate below whether in your opinion the following areas of claims management would be more improved or less improved or the use of computerisation:**

	<b>More Improved</b>	<b>Less Improved</b>
Improved record keeping	<input type="checkbox"/>	<input type="checkbox"/>
Forecasting delay estimates	<input type="checkbox"/>	<input type="checkbox"/>
Estimating effects of concurrent delays	<input type="checkbox"/>	<input type="checkbox"/>
Linking cause and effect of delays	<input type="checkbox"/>	<input type="checkbox"/>
Progress recording	<input type="checkbox"/>	<input type="checkbox"/>
Early notification of delay effects	<input type="checkbox"/>	<input type="checkbox"/>
Graphical presentation of delay effects	<input type="checkbox"/>	<input type="checkbox"/>
Computation of costs of delay	<input type="checkbox"/>	<input type="checkbox"/>

**Q15. On how many occasions are your construction programmes prepared using computer technology?**

- Over 75%
- Over 50%
- Over 25%
- Less than 25%
- Not at all





**Q19**            If you have had an extension of time claim (or claims), under ANY form of contract, rejected either in part or in total during the last 12 months, please indicate the reason(s) given by the recipient of the claim:

- Insufficient/incorrect notice            [ ]
- Claim 'too global'                        [ ]
- Insufficient support documentation      [ ]
- Claim content disputed                  [ ]
- Cause and effect not demonstrated      [ ]
- No reasons given                         [ ]
- No acknowledgement given               [ ]
- Other please state):
- .....                                        [ ]
- .....                                        [ ]
- .....                                        [ ]

**Q20.**    Does your company follow a BS5750 procedure for maintaining site documentation? (ie correspondence, invoices, delivery notes, day-work sheets etc)

- Yes                                            [ ]
- No                                             [ ]

**Q21. Would you be prepared to answer a number of brief additional questions by telephone interview?**

**IF YES, PLEASE GIVE -**

**NAME :**

**POSITION :**

**DAYTIME TELEPHONE NUMBER :**

**Date questionnaire completed: .....**

**THANK YOU FOR YOUR ASSISTANCE**

# **APPENDIX F**

## **Database**



REPORT : PHD SURVEY ANALYSIS

BACKGROUND

CONTRACTUAL & CLAIMS MANAGEMENT

COMPUTING TECHNOLOGY

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	
UNIQUE SURVEY No.	MC SC	Local Regional National	(£m) 0-50 50-100 100+	75% + 50% + 25% + >25% Nil	75% + 50% + 25% + >25% Nil	100% + 75% + 50% + 25% + >25% Nil	(Y/N)	1-3 4-6 7-9 10+	(Y/N)	(Y/N)	75% + 50% + 25% + >25% Nil	ITEMS (10 No.)	More Less Neit	ITEMS (8 No.)	75% + 50% + 25% + >25% Nil	100% + 50% + 25% + >25% Nil	100% + 50% + 25% + >25% Nil	Improve + Not	ITEMS (8 No.)	(Y/N)	
1	MC	N	10	1	7	1	N	-	N	N	7	13	M	*	7	5	5	5	-	-	Y
2	MC	N	10	1	1	10	N	-	N	Y	7	10	M	8	7	5	5	5	3	3	Y
3	MC	R	5	5	1	10	N	-	N	N	5	8	M	5	7	5	5	1	1	1	Y
4	MC	N	10	0	0	0	N	-	N	Y	7	7	M	8	0	0	0	5	5	4	Y
5	MC	L	0	1	1	0	N	-	N	Y	0	8	M	8	0	0	0	0	4	4	Y
6	MC	N	5	7	5	5	N	-	Y	Y	7	6	M	8	0	5	1	5	3	3	Y
7	MC	N	10	2	1	2	N	-	N	Y	7	6	M	8	0	10	5	5	4	4	Y
8	MC	R	0	7	1	1	N	-	N	Y	0	6	M	4	0	0	0	0	3	3	Y
9	MC	N	0	1	0	0	N	-	N	Y	0	0	N	8	0	0	0	0	0	0	Y
10	MC	N	0	1	0	0	N	-	N	Y	7	6	M	5	2	2	2	2	1	1	Y
11	MC	L	0	5	1	10	Y	1	N	Y	0	0	N	8	0	0	0	0	1	1	Y
12	MC	R	0	7	7	7	N	-	N	Y	7	4	N	0	0	0	0	0	2	2	Y
13	MC	L	0	7	1	7	N	-	N	Y	0	0	N	0	8	10	5	5	1	1	Y
14	MC	N	10	7	5	1	Y	1	Y	Y	7	6	M	4	0	10	10	10	2	2	Y
15	MC	R	5	7	5	5	N	-	N	Y	1	3	N	5	3	5	5	5	3	3	Y
16	MC	R	0	7	7	5	N	-	Y	Y	0	-	M	2	0	2	1	1	3	3	N
17	MC	N	10	7	2	7	N	-	N	Y	1	5	M	6	0	2	2	5	5	5	Y
18	MC	L	0	7	5	7	N	-	Y	Y	1	4	M	7	1	10	5	5	1	1	Y
19	MC	R	0	2	2	7	Y	1	N	Y	0	-	M	8	0	0	0	0	2	2	Y
20	MC	L	10	0	-	7	N	-	Y	Y	7	9	M	8	0	5	10	5	5	5	Y
21	MC	N	10	7	7	5	Y	1	N	N*	7	12	M	5	3	10	5	5	3	3	Y
22	MC	N	10	7	5	7	N	-	Y	Y	5	10	M	8	0	5	5	2	4	4	Y
23	MC	N	10	0	7	1	N	-	N	Y	7	6	M	8	0	10	2	5	3	3	Y
24	MC	N	0	0	5	7	N	-	N	Y	0	-	M	4*	0	1	5	5	3	3	N
25	MC	N	0	1	7	10	N	-	N	Y	1	4	N	6	0	10	2	2	2	2	Y
26	MC	L	0	7	7	7	N	-	N	Y	0	6	M	8	0	-	0	0	3	3	N
27	MC	N	0	0	0	0	N	-	N	Y	0	6	M	4	0	0	0	0	0	0	N
28	MC	N	10	1	-	0	N	-	N	Y	7	10	M	8	0	10	5	5	0	0	Y
29	MC	L	0	7	5	7	N	-	N	Y	0	-	M	8	0	5	0	0	1	1	Y
30	MC	N	0	0	0	7	N	-	Y	N	7	5	M	8	0	0	10	10	2	2	Y









<b>Notes:</b>						
<b>1. Key :</b>	<b>Q1.</b>	MC : Main Contractor SC : Sub-contractor	Q4,Q5, Q6,Q11, Q15,Q16 Q17.	Q8.	1 : 1 to 3 4 : 4 to 6 7 : 7 to 9 10 : 10+	Q13.
	<b>Q2.</b>	L : Local R : Regional N : National	10 : 100% 7 : 75%+ 2 : 25%+ 1 : Less than 25% 0 : Nil	Q12,Q14, (No.) Q19.		Q18
	<b>Q3.</b>	£ 0-50m £ 50-100m £100m+	Q7,Q9,Q10, Q20,Q21.			
			Y : Yes N : No			
<b>2. Sort criteria : Primary – Q1, Secondary – Q2.</b>						
<b>P. J. Keane</b>						

# **APPENDIX G**

## **Schedule of Additional Information**

REPORT : PhD SURVEY ANALYSIS

ADDITIONAL INFORMATION

	Q 21	Name	Position	Telephone no.	Completed	Organisation	Region
		(Y/N)	Position	Telephone no.	Date Survey Completed	Organisation	Region
UNIQUE SURVEY No.							
27	-	A Bayliss	Director		(c.25.6.93)	Kier Construction	SE
4	***				08/11/93	"Bovis"?	M
43	*	P.A.Sloane	Surveying Director	041 332 7055	05/11/93	Laing Scot/Ireland ?	Sc
32	*	G.R.Clark	Project Manager	041 305 4619	03/11/93		Sc
87		Steve Birks	QS	0429 288125 (*10.1.94)	23/12/93		NE
54	Y*	P.Johnson	Commercial Director	051 531 8422 (Home)	06/01/94		NW
33	YES!	Tony Harker	Quantity Surveyor	0343 811015	08/11/93	Shaw Harker Associates	Sc
63	YES	Alan Ritchie	0698 824411		08/11/93		Sc
113	Y	N.H.Vincent	Managing Director	081 346 9351	25/08/93		SE
86	Y	A.J.Penn	Managing QS	081 953 5333	23/08/93		SE
111	Y	A.G.Williams	Managing Director	071 387 1445			SE
103	Y	David Powell	Area Surveyor	0272 637931	28/08/93	Trafalgar House Constr.	SW
115	Y	Andrew M Board	Chief Surveyor	081 508 5555	02/09/93		SE
20	Y	D.J.Kelly	Area manager	0222 66835	05/10/93		SW
40	Y	C.Cox	Commercial Director	0235 848811	16/09/93		SE
78	Y	J.N.Tait	Director	N/A	23/08/93		SE
2	Y	B.J.Cook	Chief QS	0222 811481	05/10/93	AMEC Building Ltd	SW
77	Y	A.J.King	Director	081 946 3085 (?)	16/08/93		SE
70	Y	L.Pursey	Commercial Manager	071 923 0909	23/08/93		SE
19	Y	P.J.Tipple	Solicitor (Legal Dept)		16/08/93	Translink Joint Venture	SE
8	Y	D.J.Lester	Commercial Director		06/09/93	Wimpey Constructn UK	SE
31	Y	D.W.Foord	Legal Manager	081 846 2677	17/08/93		SE
17	Y	T.K.Dulieu	Subcontracts Manager	081 200 7070	23/08/93		SE
102	Y	M.J.HAYTER	Senior QS	071 262 8080	23/08/93		SE
141	Y	Peter Collier	Managing Surveyor	0582 491491	16/08/93		SE
90	Y	John Torbitt	Director	0737 242466	24/08/93		SE
106	Y	A.R.Rostock	Surveyor/Estimator	0449 79567	17/09/93		SE
15	Y	R.B Broadbent	Computer Servs Managr	0726 74411	06/10/93		SW
61	Y	C. A. Lorena	Director	0442 235588	25/08/93		SE
142	No!			0780 720058	10/05/93	Collyweston	SE
					29/12/93		NE





38	118	David Love	Director	0532 636343	16/12/93	NE
123	125	W.H.Holden	Divisional QS	0225 428441	23/12/93	NE
45	62	(S.J.Williams)	Commercial Director	0564 779191	20/10/93	SW
99	128	David Readett		0925 822821	21/12/93	NE
47	168	(Mr Madgwick)		(0724 863241)	12/11/93	Sc
91	86	H.F.Dowrie			08/11/93	M
6	100	Ian Woosey	041 221 3860 Managing Director	021 476 4151	07/12/93	NW
112	53				10/01/94	SW
124	117				(7.1.94)	NW
79	148	K.G.Griffin	Director	0793 527239	17/11/93	NE
144	171	Roger Read	Chief QS	0707 329481	10/11/93	Sc
140	90	D.Landy	Director	0784 483113	(4/11/93)	M
100	157	D.Summers	Contracts Manager	0222 747807	24/12/93	Sc
84	129	K.W.Hensman	Director	081 773 9770	07/10/93	NE
163	47	Milton S Miltiadou	Company Secretary	081 692 6655	16/08/93	SW
154	15	A. Spear	Commercial Director	0428 643393	23/08/93	SE
171	39	J.H.Thomas		0844 208481	09/11/93	SE
146	45			(0923 254646)	06/10/93	SW
148	7				16/08/93	SE
150	8				10/09/93	SE
161	17				23/08/93	SE
169	10				24/08/93	SE
147	27				24/08/93	SE
173	72				28/09/93	SW
157	25					SE
149	126	Stan Birkett	Chief Surveyor	0924 378222	21/12/93	NE
160	156	Iain Kent	QS Manager		03/11/93	Sc
170	135	Francis Hargate (?)	Finance Director	0709 371122	21/12/93	NE
172	81	T.J.Shaul	Managing Director	0272 518274	28/09/93	SW
166	164				(5/11/93)	Sc
153	175	Ian White	Manager QS Services	0703 644522	06/12/93	Sc
164	144				(13/01/94)	NE
156	105	Tony Kenny	Chief Estimator	0744 22299	18/12/93	NW
162	147	Joe McQuade	Managing Director	0536 412044	27/12/93	NE
167	38	(Mr Wort)			19/11/93	SE
145	35					SE
165	41					SE
155	109	E.D.Williams	Chairman & MD	0928 576435	12/12/93	NW
151	162				08/11/93	Sc
168	56	Ian Tandy	General Manager	0793 486631	08/10/93	SW
152	108	K.Stock	Chief Surveyor	0928 567331	10/12/93	NW
159	101	L.P.Harvey (??)	Director	0883 340418	05/12/93/8*	NW
158	123				23/12/93	NE

# **APPENDIX H**

## **Schedule of Statistical Results**

## SCHEDULE OF STATISTICAL RESULTS

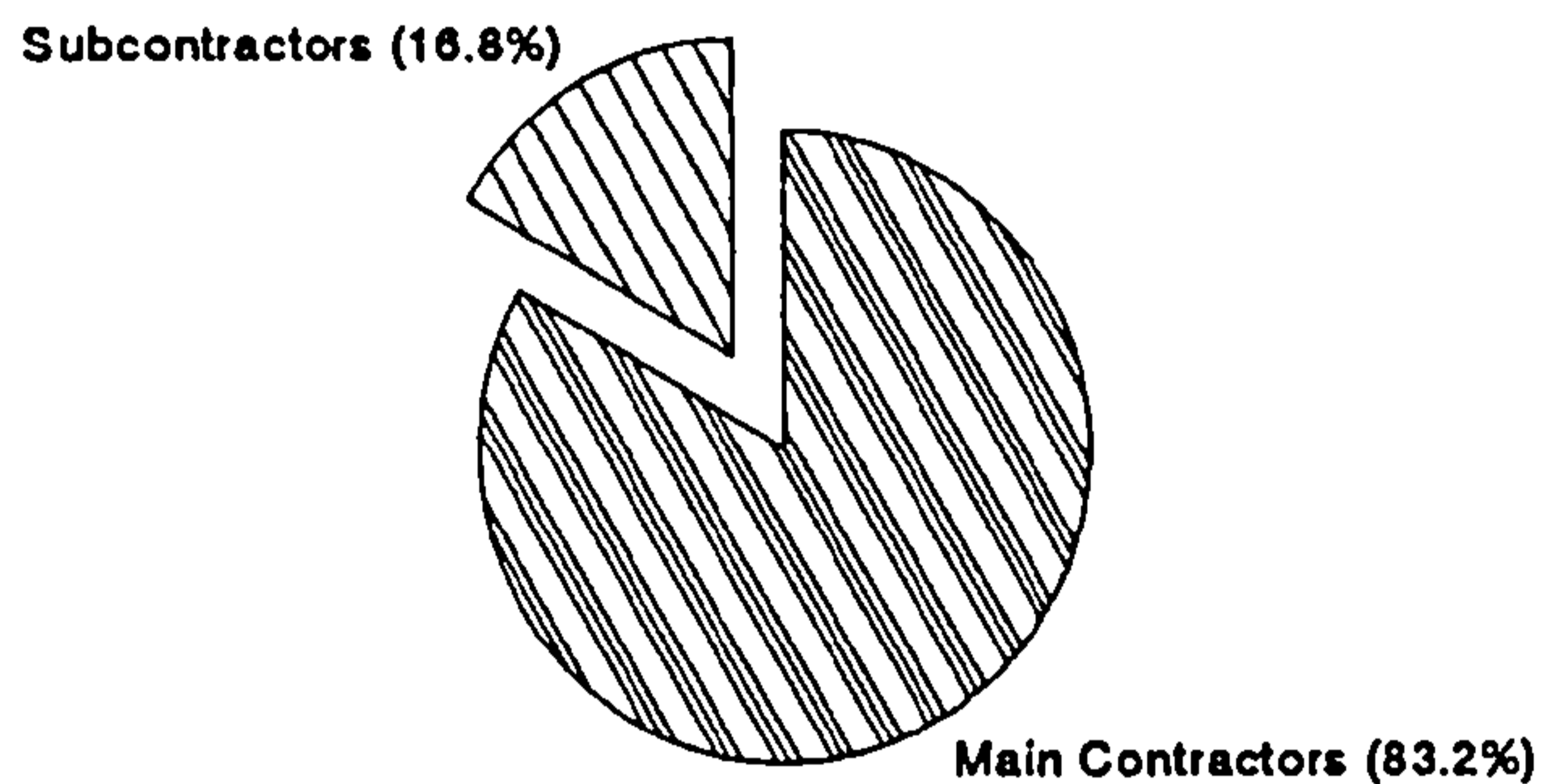
1. Each result is expressed as a percentage of the responses received to each question.
2. The sample frame size was 2,423 of which 345 companies were selected.
3. A total of 194 responses were received of which 173 were valid. The remainder comprising questionnaires returned blank by the target respondent, the post office, or in some cases fell outside the sample categories.

### BACKGROUND

#### Q 1. Principal activity of company.

Main Contractors	144	83%
Subcontractors	29	17%
<b>TOTAL</b>	<b>173</b>	<b>100%</b>

( Figure : surv-01 )



#### Q 2. Main geographic location of companies.

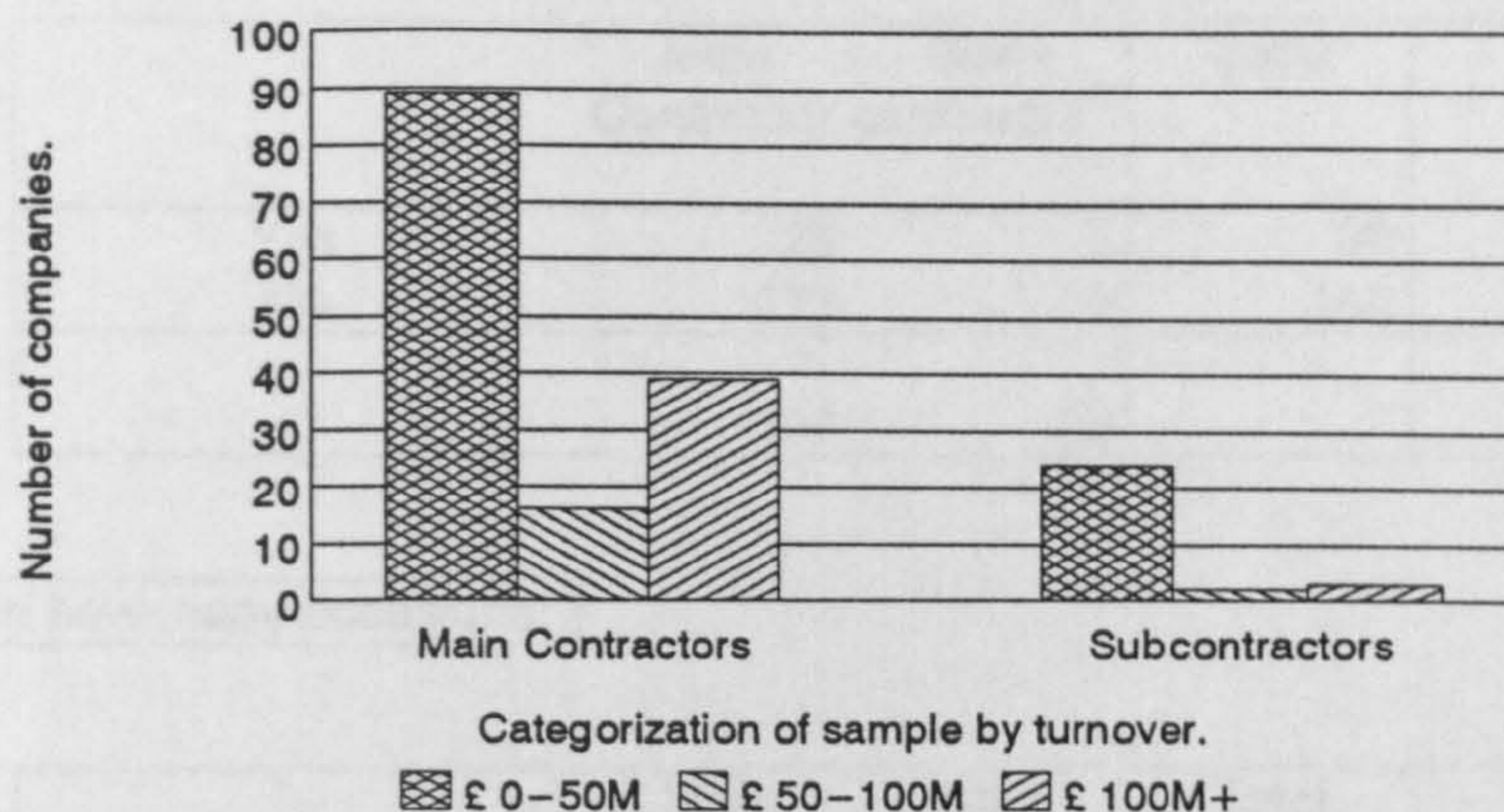
	Main Contractor	Sub Contractor	Total	%
National	59	17	76	44
Regional	39	5	44	25
Local	46	7	53	31
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

#### Q 3. Turnover in last financial year.

	Main Contractor	Sub Contractor	Total	%
£ 0-50m	89	24	113	65
£ 50-100m	16	2	18	10
£100m+	39	3	42	24
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>



( Figure : surv.03 )



**Q 4. Frequency of executing work under a JCT contract in past 2 years.**

	Main Contractor	Sub-contractor	Total	%
Over 75%	73	7	80	46
Over 50%	22	12	34	20
Over 25%	15	3	18	10
Less than 25%	20	5	25	14
Not at all	14	2	16	9
	144	29	173	100

**Q 5. Frequency of need to submit EOT claims on contracts where JCT form used.**

	Main Contractor	Sub-contractor	Total	%
Over 75%	18	1	19	11
Over 50%	30	6	36	21
Over 25%	30	7	37	21
Less than 25%	43	11	54	31
Not at all	23	4	27	16
	144	29	173	100

**Q 6. Following submission of an EOT claim under JCT, what is rate of satisfaction.**

Occasions	Main Contractor	Sub-contractor	Total	%
None	15	6	21	12
Less than 25%	17	8	25	14
Over 25%	8	1	9	5
Over 50%	29	7	36	21
Over 75%	51	3	54	31
100%	13	3	16	9
N/A	11	1	12	7
	144	29	173	100



**Q 7. Had company commenced arbitration or litigation proceedings since Jan.1993.**

	Main Contractor	Sub-contractor	Total	%
Yes	25	5	30	17
No	119	24	143	83
	144	29		100

**Q 8. If so on how many occasions.**

	Main Contractor	Sub-contractor	Total	%
1 to 3 occasions	23	2	25	14.45
4 to 6 occasions	2	3	5	2.89
7 to 9 occasions	0	0	0	0.00
Over 10 occasions	0	0	0	0.00
	25	5	30	

**Q 9. Does the company directly employ individuals assigned solely to working on, and/or advising in connection with contractual time and money claims.**

	Main Contractor	Sub-contractor	Total	%
<b>Directly employed specialists :</b>				
Yes	30	8	38	22
No	114	21	135	78
Totals	144	29	173	100

**Q 10. Does the company employ external consultants to work on, and/or advise in connection with contractual time and money claims.**

	Main Contractor	Sub-contractor	Total	%
<b>External consultants :</b>				
Yes	70	17	87	50
No	74	12	86	50
Totals	144	29	173	100



**COMPUTING TECHNOLOGY**

**Q. 11 Frequency with which companies use computers on construction site locations.**

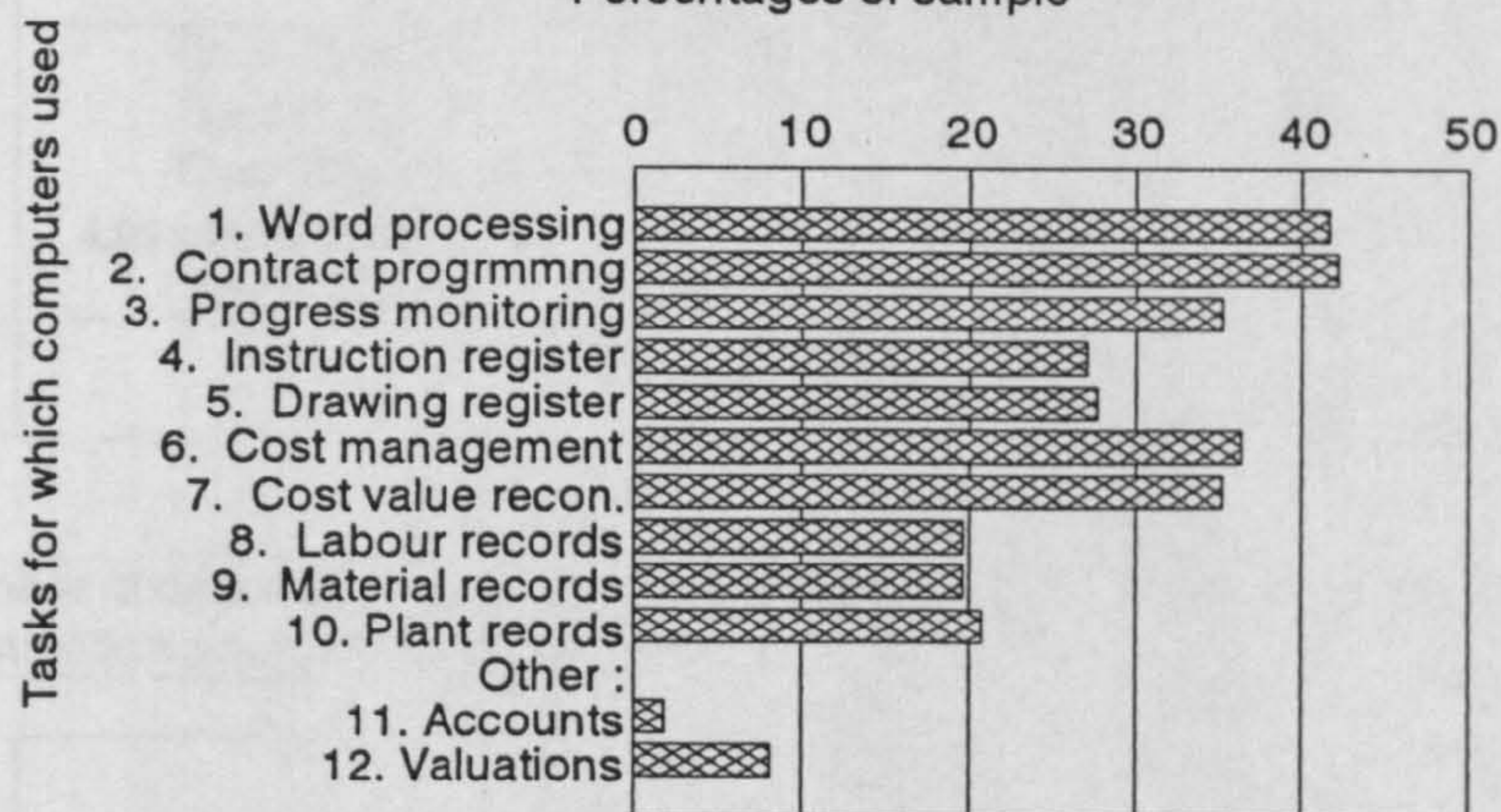
	Main Contractor	Sub-contractor	Total	%
Over 75%	33	1	34	20
Over 50%	10	1	11	6
Over 25%	14	2	16	9
Less than 25%	24	4	28	16
Not at all	63	21	84	49
<b>Totals</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 12 Tasks performed by computers where used on construction site locations.**

	Main & Sub Contractor	%
1. Word processing	72	42
2. Contract progmmng	73	42
3. Progress monitoring	61	35
4. Instruction register	47	27
5. Drawing register	48	28
6. Cost management	63	36
7. Cost value recon.	61	35
8. Labour records	34	20
9. Material records	34	20
10. Plant reords	36	21
Other :		
11. Accounts	3	2
12. Valuations	14	8

( Figure : surv.14 )

Percentages of sample





**Q. 13** Would companies be more in favour, or less in favour, of investing in computing technology if it were possible to improve the companies success rate in claim settlement using computerisation.

	Main Contractor	Sub Contractor	Total	%
More in favour	97	19	116	67
Less in favour	0	1	1	1
Neither	47	9	56	32
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 14** Activities of claims management considered by respondents more likely to be improved by the use of computerisation.

Area of Claims management	Main & Sub Contractor	%
1. Record keeping	124	72
2. Foecasting delay estimates	106	61
3. Estimating effects of concurrant delays	114	66
4. Linking cause & effect	102	59
5. Progress recording	123	71
6. Early notification of delay effects	89	51
7. Graphical presentation of delay effects	124	72
8. Computation of costs of delay	119	69

**Q. 15** Frequency of which companies prepared their construction programmes using computer technology.

	Main Contractor	Sub-contractor	Total	%
Over 75%	69	6	75	43
Over 50%	13	1	14	8
Over 25%	10	2	12	7
Less than 25%	8	9	17	10
Not at all	44	11	55	32
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 16** Number of occasions upon which compnies base their computer generated construction programmes on a critical path network.

	Main Contractor	Sub-contractor	Total	%
Over 100%	34	1	35	20
Over 50%	32	6	38	22
Over 25%	9	2	11	6
Less than 25%	19	7	26	15
Not at all	50	13	63	36
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 17** Number of occasions upon which companies base their EXTENSION OF TIME claims on critical path analysis.

	Main Contractor	Sub-contractor	Total	%
Over 100%	24	3	27	15.61
Over 50%	33	1	34	19.65
Over 25%	18	4	22	12.72
Less than 25%	27	6	33	19.08
Not at all	42	15	57	32.95
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 18** View of respondents on the question of whether the practice of maintaining a common set of AGREED site progress records with the Employer on a regular basis throughout the contract period would improve or not improve the (satisfactory) settlement of extension of time claims.

	Main Contractor	Sub Contractor	Total	%
Improve	118	24	142	82
Not improve	24	3	27	16
No response	2	2	4	2
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 19** Reasons given to companies where they have had a claim (or claims) rejected in whole or part during the last 12 months, under any form of contract.

Reasons given for rejection of EOT claims	Main & Sub Contractor	%
1. Insufficient/incorrect notice	23	13
2. Claim "too global"	34	20
3. Insufficient support documentatn	47	27
4. Claim content disputed	88	51
5. Cause & effect not demonstrated	60	35
6. No reasons given	21	12
7. No acknowledgement given	8	5
Other reasons given :		
(a) "Further and better particulars requested" (004)		
(b) "Disputes arise as to whether periods [of prolongation] carry loss and expense"(031)		
(c) "Compromise settlement"(050)		
(d) "Contractors fault"(062)		
(e) "Withdraw or be removed from tender list"(068)		
(f) "Extension deemed hypothetical"(078)		
(g) "As a subcontractor we are manipulated by the Main Contractors Agreements with the Architect/Employer!"(081)		
(h) "Valuation method disputed"(148)		

**Q. 20 Percentage of respondent companies who follow a BS5750 procedure for maintaining site documentation (eg. correspondence, invoices, delivery notes, daywork sheets etc.,**

	Main Contractor	Sub-contractor	Total	%
Yes	94	14	108	62
No	50	15	65	38
<b>Total</b>	<b>144</b>	<b>29</b>	<b>173</b>	<b>100</b>

**Q. 21 Respondents prepared to answer additional questions by telephone interview.**

	Main Contractor	Sub-contractor	Total	%
Yes	25	8	33	19
No	23	3	26	15
<b>Total</b>	<b>48</b>	<b>11</b>	<b>59</b>	<b>34.10404</b>

P J Keane  
Cambridge

File reference : ..\surv-01.wk1  
Last updated 2.9.94



# **APPENDIX I**

**Experts briefing letter**

**P J Keane** MSc.,FCIOB.,ACI Arb.

The Gables  
Cambridge  
Cambridgeshire

**PRIVATE AND CONFIDENTIAL**

Reference : PJK\LUT\L\expert.001

NAME  
ADDRESS

9 June 1994

Dear

**RESEARCH THESIS : LOUGHBOROUGH UNIVERSITY OF  
TECHNOLOGY  
TOPIC : COMPUTERISATION AND CLAIMS MANAGEMENT**

I am currently concluding a work of research comprising the application of systems analysis to an area of the construction management process, namely claims management of time extension applications.

I have been working on this project on a part-time basis over a period of 4 years and will be presenting the findings shortly in a written thesis. This will form a submission to Loughborough University of Technology (Civil and Building Engineering department) in partial fulfilment of their requirements for the award of a Doctorate degree.

The research comprised several main stages briefly summarised as follows.

To begin with I undertook a full **Literature Review** to identify what was known and written about claims management and in particular its failings and shortcomings.

This was followed by an **Industrial Survey** of 175 contractors, with a combined turnover estimated at £6.23 billion pounds, (or 17 % of total industry output) to identify the same difficulties from a practical perspective.

Using the information gathered from both of the above investigations I then set about contrasting the findings of both, arriving at deductions and drawing relevant conclusions

On the basis of the findings and subsequent conclusions I isolated a particular

problem area, namely the high incidence of the contractors dissatisfaction with extension of time awards being made, (83% on one or more occasions). I observedn that this may be due in large part to contractors failure in their analysis, assessment and presentation of claims. For example 35% of contactors have had claims rejected on the grounds that cause and effect had not been demonstrated and a further 20% because the basis for the claim had been global in approach.

It was also indicated from the survey that some 50% of contractors do not use computers on their site locations to assist their construction management activity, and 32% of contractors fail to use any form of critical path analysis to asses their time extension claims.

I then set about formulating a solution strategy which combines a systematic approach with the use of computing technology, the principal objective being to remove or eliminate as far as possible the subjectivity from this area of claims management.

The current and final stage of this research project requires the testing and validation of my proposed solution which comprises "a computerised system for time analysis review", abbreviated to CoSTAR.

A test or trial implementation of the system has already taken place on a multi-million pound fast track refurbishment project which had suffered a 35% contract time period overrun, with associated cost implications running into millions of pounds. The results of this test were most encouraging and have been written up in the body of the thesis.

The last part of this final stage seeks to compliment the trial test by obtaining separate expert validation of the new system from construction professionals experienced in this particular area of claims management, seeking the views of both the construction lawyer and the technical expert. It is for this task of expert evaluation that I seek your assistance.

The validation process will take the form of a brief interview, (which should last no more than 30-45 minutes), during which time I will demonstrate the new systematic approach, explain or clarify any queries which may arise, and ask you a short series of questions designed to measure the new approach against a set of system objectives.

I will telephone you to confirm an appointment and look forward to our meeting.

Yours sincerely

John Keane.

## **APPENDIX J**

### **Experts Validation Questionnaire**

# EXPERT VALIDATION QUESTIONNAIRE

DATE OF EXPERT INTERVIEW :        /        / 1994

**"WOULD THE FOLLOWING SYSTEM OBJECTIVES BE ACHIEVED BY THE IMPLEMENTATION OF THE CoSTAR APPROACH ?"**

NAME OF EXPERT :  
 QUALIFICATIONS :  
 PROFESSION :  
 CURRENT JOB DESIGNATION :

No.	SYSTEM OBJECTIVE	RESULT Yes : 10 Part : 1-9 No : 0	COMMENTS
1.	<b>IDENTIFY each causative event which has affected or contributed to an alleged critical delay.</b> (For inclusion in the "Master Shedule of Delay")		
2.	<b>IDENTIFY and SCHEDULE the essential source material evidence pertaining to each causative event.</b> (For inclusion in the "Master Schedule of Delay" and for use in collation of supporting documentary bundles appended to claim assessment submission)		
3.	<b>IDENTIFY and SCHEDULE historic progress of the works for each programmed activity.</b> (For inclusion in the "Schedule of Progress")		



No.	SYSTEM OBJECTIVE	RESULT	COMMENTS
4.	<p><b>IDENTIFY and tag each causative event with the contractual/legal basis of the claim</b>            (For inclusion in the "Master Shedule of Delay")</p>		
5.	<p><b>CONSTRUCT a computer based model of the original construction programme with all the interdependent activities fully logically linked.</b>            (For use in the "Delay Impact Simulation" process)</p>		
6.	<p><b>INTERPRET the scheduled causative events in terms of localised construction programme constraints.</b>            (For inclusion in the "Schedule of Delay Impacts")</p>		
7.	<p><b>CALCULATE the critical delay effect of each alleged causative event resulting from the "DELAY IMPACT SIMULATION" exercise.</b>            (For inclusion in the "Master Schedule of Delay")</p>		

No.	SYSTEM OBJECTIVE	RESULT	COMMENTS
8.	<p><b>CONSTRUCT an "As-Built" record tracking the historic progress of the works.</b> (For inclusion in the "Claim Assessment Submission")</p>		
9.	<p><b>Describe in narrative format full particulars of each causative event of a critical delay, cross-referenced to the "Master Schedule of Delay"; the appended "Bundle of Documentary Evidence"; and any other relevant source.</b> (For inclusion in the "Claim Assessment Submission")</p>		
10.	<p><b>COLLATE the analysis results and supporting evidence into a report style format to include:--</b> <i>introductory preambles, narrative text, schedules, charts, programmes, reports, and copied documents.</i> (For inclusion in the "Claim Assessment Submission")</p>		
	<p>Ref: ..\Table--7 DRAFT LAST UPDATED : 9.6.94 ( Table for Chapter 7.0 )</p>		