

# **Implementing TQ in the construction industry**

**A PRACTICAL GUIDE**

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## Preface

This handbook has been researched and published for the construction industry to give practical advice on the use of Total Quality. Total Quality is an umbrella phrase covering continuous improvement, Quality systems and standards (eg ISO9000), culture change and staff development (eg Investors in People).

The members of the four teams who participated in this venture were drawn from client, contractor and consultant backgrounds. The project has been part funded by the Department of the Environment's Construction Sponsorship Directorate under its Partners in Technology programme.

The guidance contained in this handbook, and the companion workbook - Grow your own Quality Improvement Team is appropriate to all types of organisation in the construction industry. Some of the techniques described will only be applicable for those with twenty or more staff, but firms smaller than this should be able to adapt many of the principles.

The construction industry covers all aspects of developing, constructing and commissioning capital projects for clients/owners. It also offers support in operating, maintaining and ultimately demolishing the capital assets provided by the projects. The industry spans a wide spectrum of activities from building and civil engineering to oil, gas and nuclear plant. Stakeholders are numerous and include manufacturers, suppliers, fabricators, architects, engineers, surveyors and building contractors. In addition, banks and insurance companies are involved in financing and risk sharing roles. Most of the stakeholders subscribe to institutions which work to represent their members in the industry.

The value of the output of the industry in the UK is approximately £50 billion, which is a significant 8% of the country's GDP (Gross Domestic Product). Large construction companies (with 80 or more employees) account for over 40% of the work load by value and set the lead in the industry. However much of their work is subcontracted to companies employing less than twenty staff.

The construction industry therefore has a multiplicity of regulation, numerous stakeholders and in many instances a one-off unique product to produce. Much work has been done in recent years to reduce the adversarial nature of contractual relationships and to concentrate effort on partnering or alliancing arrangements between stakeholders. The principles of risk and reward sharing need to be more widely implemented to improve performance on projects and provide substantial reductions in cost and time, and improvements in the delivered quality of projects. Total Quality is recognised as being a key ingredient in achieving this breakthrough in performance.

The European Construction Institute is dedicated to improving the performance of the construction industry. It carries out research through task teams, set up with resources from member companies, who explore the key issues of the day and formulate proposals for improvement. The ECI TQ task team wishes to thank the following organisations for their contributions to this project

Balfour Beatty Civil Engineering Ltd  
Balfour Beatty Projects and Engineering Ltd  
British Gas plc  
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Business Enhancement Ltd  
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Chevron UK Ltd  
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TQM International  
Venn Associates

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## How to use this handbook

A Total Quality approach has been widely and successfully used in manufacturing and many service industries to reduce costs, increase productivity and improve quality for the benefit of customers. The broad aim of this handbook is to widen the understanding and uptake in the construction industry of the methods and tools which are collectively known as Total Quality (TQ).

The handbook has four **self contained** sections, each addressing the subject from a different point of view. The emphasis is on practical help, i.e. what to do and how. The sections are as follows,

### **Chapters 1 and 2 - Influencing top management and starting your TQ programme**

Top managers of large or small companies that have heard about TQ and want to know

- ★ what TQ is
- ★ what it could do for their company (with real examples)
- ★ how much it would cost
- ★ how long it would take
- ★ what to do to get started

It includes example budgets, schedules, surveys and presentation material.

### **Chapters 3 and 4 - Culture change and how to involve employees**

Top and middle management, and project and team leaders who want to start using TQ with their group. The key to this is changing the culture. Chapter three covers

- ★ what is a company's culture?
- ★ why change your culture?
- ★ how to get started

Chapter four is a detailed programme to begin changing the culture and working habits of a small team. It includes

- ★ presentation slides (reproduction permitted) with notes to run the programme
- ★ a flowchart with approximate durations and the slides required
- ★ examples and a complete case study

### **Chapter 5 - TQ in a construction project**

Project directors, managers and lead engineers who want

- ★ to know how TQ can help their project
- ★ examples of how it has worked in other projects
- ★ the principles they should concentrate on
- ★ the actions to take during each of the project phases

### **Chapter 6 - Benchmarking the construction project process**

Top and middle managers considering the use of benchmarking. Chapter six includes

- ★ the different types of benchmarking
- ★ how it is done
- ★ questionnaires to measure construction processes



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# 1. Influencing top management

## Why start Total Quality?

The three reasons most commonly cited by companies as to why they started TQ are

- ★ to reduce cost, improve profitability or to improve performance
- ★ customers wanted it
- ★ the chief executive wanted it

The basic purpose of a business is to make a profit by selling a product or service at a greater price than it costs to provide. An operation can only be justified if it adds value or reduces costs. TQ does reduce costs, improve profitability and performance, for some real examples see page 14. Some of the advantages can be achieved quickly, but the full benefits may only be apparent over several years.

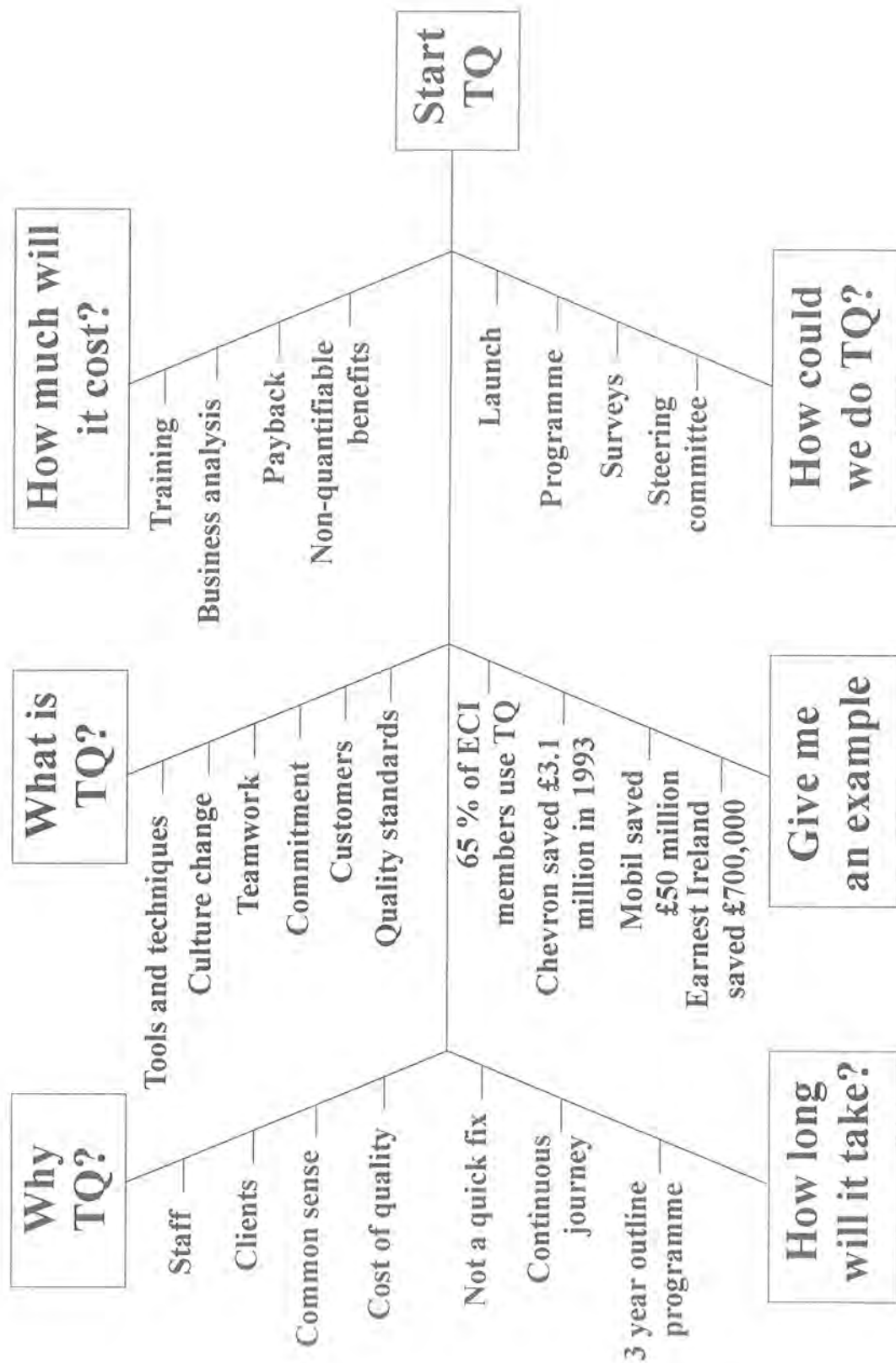
Customers have wanted TQ for broadly two reasons: they are a client company with a TQ strategy in place and want to extend it to their suppliers and so benefit from the resulting improved relationships, or they would prefer to deal with a company that visibly focuses on its customers and is always trying to improve.

What the chief executive wants the chief executive gets is often but not always the case! Conversely, without commitment from the top, plans are unlikely to be implemented. Almost without exception every successful TQ company has a leader with a long term belief in TQ - a Quality Champion.

These are so called 'hard', tangible drivers. Other firms have initiated TQ for 'people' reasons; it improves morale, team working, communication, trust and such like and reduces staff turnover and absenteeism. These 'soft' issues still have a strong indirect effect on the bottom line.

## Why should your company start TQ?

- ★ You want to keep your current customers by giving them a better product, a better service and by listening to them
- ★ You want to win new customers by having a reputation of being good to work with, customer focused and innovative
- ★ To save money. The 'Cost of Quality' - prevention, inspection and correction - may account for up to 40% of turnover (source ICAEM), so any reduction will have a direct effect on profits
- ★ To improve your company by instilling the attitude in all staff of continuously looking for improvements and better ways of working
- ★ Some attitudes in the construction industry cause needless expense and can be improved from 'them and us' to team work, from adversarial contracts to partnering and alliancing, from barriers to open communication
- ★ It is an opportunity to get ahead of your competitors - TQ is becoming more widely recognised, so starting on the road early will give you a competitive advantage in the future
- ★ You want to influence your suppliers to participate in the process of continuously improving service to your customers



## What Is Total Quality?

Total Quality is nothing new, much of it is common sense and you are probably applying a majority of that already. It is a fresh approach to improving the efficiency, competitiveness and profitability of a company. Just because it refers to quality, it is not all about paperwork. It is about people and processes.

TQ is a long term programme and will not provide a 'quick fix' solution to any situation. Once TQ is embarked upon it is a continuous journey to improve your way of working. Indeed, if a company decides that it has reached the point of producing to the right quality without any further need for TQ, then that would be the start of a decline in quality.

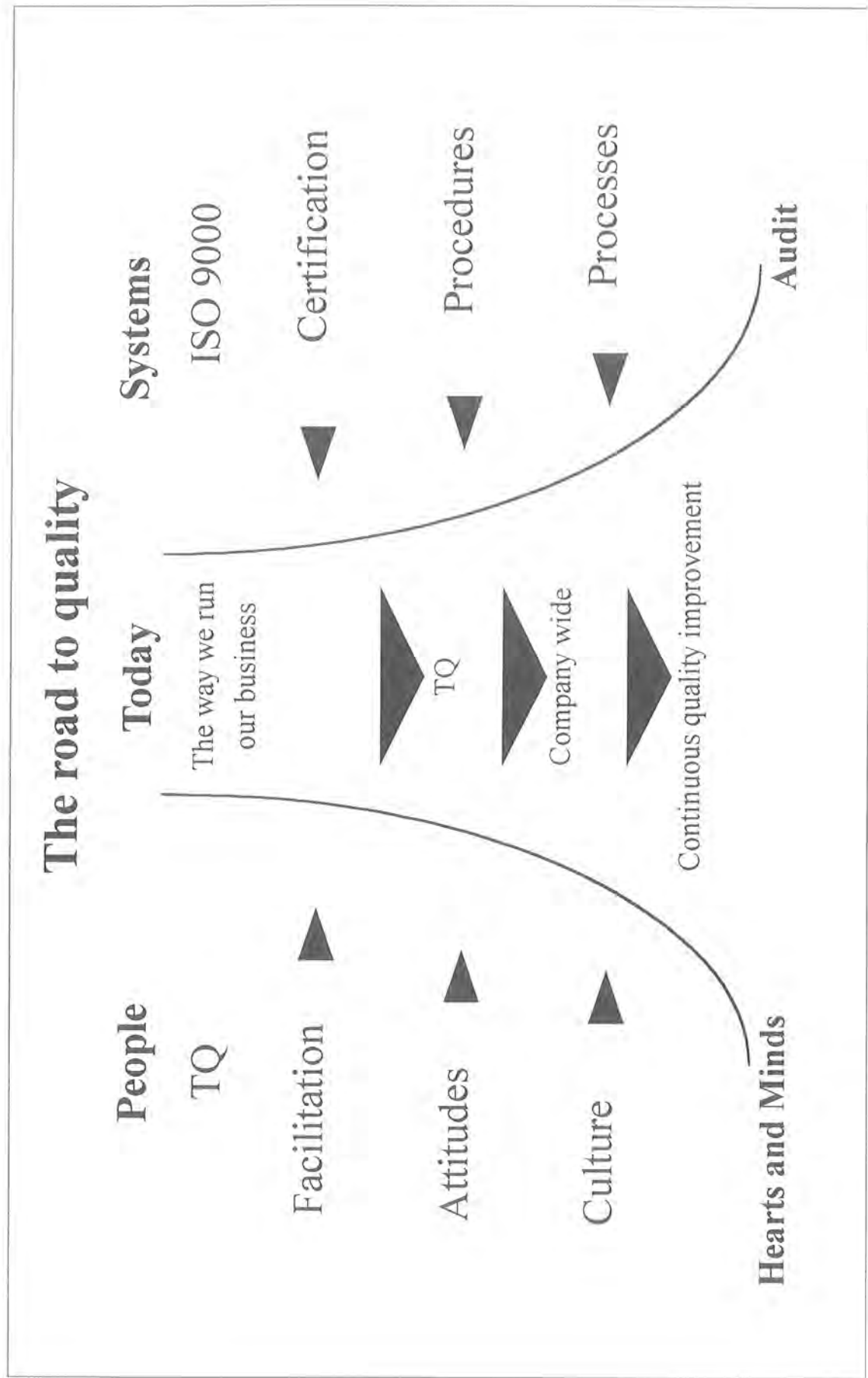
TQ involves a culture change throughout the organisation where everyone is encouraged and able to satisfy both internal and external customers' demands or requirements and to strive for continuous improvement. This may be achieved by encouraging constructive criticism, self appraisal and a team spirit amongst employees, where the good of the company is seen as the objective, rather than the good of the department.

Improvements gained through TQ activities must be measured and monitored to show their benefits. Often this may be difficult to achieve as there are always visible and invisible benefits of TQ. However, various parameters must be highlighted, depending upon the improvement, to show that there are direct benefits in improving efficiency.

The word 'total' is meant to emphasise the fact that it must involve everyone in the organisation. This is different to implementing Quality Assurance, where not everyone is involved to the same degree- with TQ the benefits may be seen for everyone, including engineers, painters, directors, receptionists and security guards. TQ is a means of improving the way you operate at every level and every process you are involved in. Everyone is required to review the way they operate and suggest methods of improving both the way they work and the way work is given to them.

It is of course a matter of making money at the end of the day and TQ is recognised as a way of improving efficiency and effectiveness which in turn will lead to increased profitability. It is not only a means of reducing errors and wasted effort, although that is an important aspect of TQ, but is also a method of supplying your external client with a quality product. Quality is seen as 'fitness for purpose', and will ensure that your customers consider you for future work.





## What is the difference between TQ and QA?

|    | Quality Assurance                                                                                                    | Total Quality                                                                                                                                                                                           |
|----|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | QA is only part of TQ. It is a systematic approach which gives adequate confidence and satisfies given requirements. | TQ is a process to give continuous improvement in the performance of all activities, which provides satisfaction for customers, both internal or external and includes principles, tools and techniques |
| 1  | Part of quality improvement process                                                                                  | A process for continuous improvement                                                                                                                                                                    |
| 2  | A systematic approach, influences attitudes and working environment                                                  | Changes attitudes and the working environment and provides tools, techniques and systems for continuous improvement                                                                                     |
| 3  | Aims to ensure customers' requirements are met every time                                                            | Creates a 'right first time' attitude to delight customers                                                                                                                                              |
| 4  | Provides a base line for measuring the cost of quality                                                               | Cost of quality is recognised as vital, and provides measurement for continuous improvement                                                                                                             |
| 5  | Provides confidence to the customer of the quality of the product or service                                         | The supplier of the product or service is recognised as a quality company by customers and employees                                                                                                    |
| 6  | Provides the means to reduce waste                                                                                   | Seeks to eliminate waste                                                                                                                                                                                |
| 7  | Enhances publicity and image                                                                                         | Attracts publicity and company used as a role model for quality                                                                                                                                         |
| 8  | Provides procedures for doing things right                                                                           | Provides for doing the <i>right</i> things right                                                                                                                                                        |
| 9  | Improvement is by eliminating recurring problems                                                                     | Improvement is by cultural change, based on measurement of performance and elimination of root causes and constraints                                                                                   |
| 10 | Requires a structured organisation and a statement of key responsibilities                                           | Creates a culture in the organisation that seeks to improve in all its activities continuously                                                                                                          |
| 11 | Directive and provides procedures for all activities and working practices                                           | Focuses on a full understanding of the various business processes by the day to day involvement of all concerned                                                                                        |

|    | Quality Assurance                                                                                                  | Total Quality                                                                                                                                              |
|----|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | Provides quality records of all activities                                                                         | Uses quality records for measurement and for continuous improvement                                                                                        |
| 13 | The system relies on regular monitoring and audits to identify and correct non-conformances and improve procedures | Involves gathering ideas and suggestions for improvements from everyone                                                                                    |
| 14 | Regular management reviews of the procedures and working practices leads to improvement                            | Stresses the importance that products and services delivered to the customer (whether internal or external) meet the requirements whether specified or not |
| 15 | Ensures that people are trained and experienced                                                                    | Ensures that everyone in the organisation receives education and training to enable them to do their job effectively and achieve personal satisfaction     |

## How long will it take?

Once top management is committed to the ideas and benefits of TQ, an implementation programme needs to be designed to include the following key milestones.

- 1) Appoint TQ co-ordinator (and steering committee)
- 2) Decide on a name and structure
- 3) Allocate budget
- 4) Agree programme
- 5) Introductory management seminar
- 6) Issue questionnaire to discover present employees' attitudes and concerns
- 7) Pre-launch publicity
- 8) Launch
- 9) Cascade introductory meetings
- 10) Introduce awareness sessions
- 11) Start up Quality Improvement Teams
- 12) Review situation and re-plan next phase

See the TQ implementation plan on page 9. This sample plan lasts for 24 months, and includes a review of progress in the last month. Two years is the usual period for the ideas of TQ to be taken up and when benefits begin to show. Small companies have a distinct advantage due to their closer structure. They are likely to be able to bring in TQ more quickly and may not require such a rigid programme.

There may begin to be a feeling of complacency after this period, so the next phase needs to re-inject enthusiasm.

# TQ implementation plan

| Month                          | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|--------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| <b>Decision to implement</b>   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Planning</b>                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Research                       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Programme                      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Budget 1-3 years               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Steering committee</b>      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Initial seminar                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Budget and programme review    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Ongoing                        |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Launch</b>                  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Publicity and promotion</b> |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Awareness and education        |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Management                     |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Staff                          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Problem solving</b>         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Identifying issues             |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Team training                  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| First group of QITs            |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Second group of QITs           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Third group of QITs            |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Fourth group of QITs           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Fifth group of QITs            |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Management education</b>    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| <b>Review of progress</b>      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

## How much will it cost?

Although the return on investment is potentially high, a participating company must be prepared to invest in order to get things going. Initially there will be a number of 'soft' improvements, i.e. not necessarily quantifiable in terms of money. Soon, however, costed potential improvements will be identified by the Quality Improvement Teams. These will help sell the programme and may be offset against the budget.

Below are two example budgets showing the investment of resources needed for the first two years. The first is for a firm with 650 employees and the second is for one with 50 employees. It should be emphasised that the programme is for two years, so the investment in training and resulting benefits should not be compared prematurely. After two years, the programme should be self funding. The diagram opposite shows the management structure needed for a TQ programme in a large firm.

**Example two year budget for a firm with 650 employees**

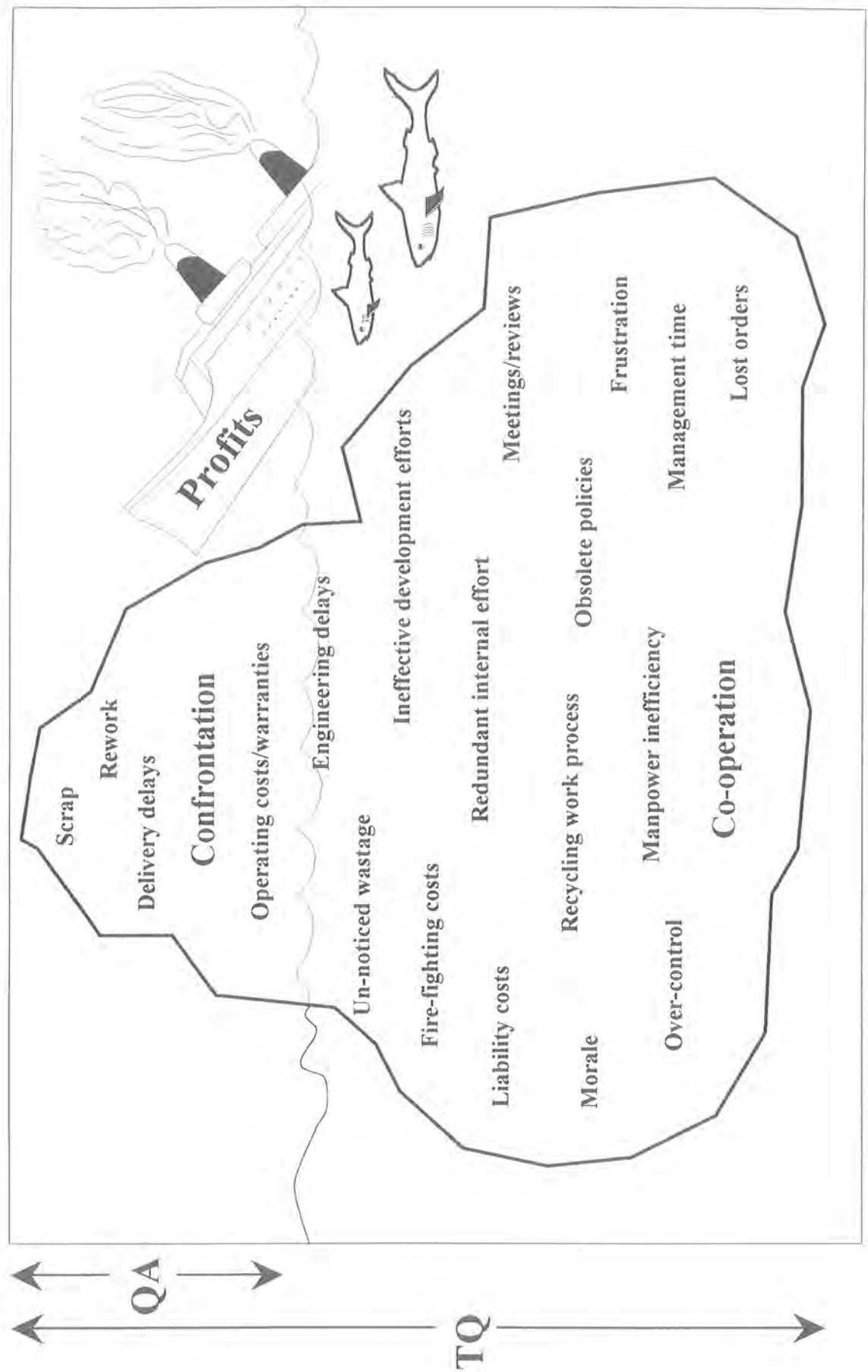
|    | Item                                                                     | No of people          | Duration     | Frequency          |
|----|--------------------------------------------------------------------------|-----------------------|--------------|--------------------|
| 1  | TQ co-ordinator at 2 days per week ongoing                               | 1                     | 24 months    | 8 days per month   |
| 2  | TQ assistant co-ordinator at 2 days per week ongoing                     | 1                     | 24 months    | 8 days per month   |
| 3  | Training manager at 1 day per week ongoing                               | 1                     | 24 months    | 4 days per month   |
| 4  | TQ advisor or consultant at 2 days per month                             | 1                     | 24 months    | 2 days per month   |
| 5  | Management seminar - 30 people for 4 hours                               | 30                    | 4 hours      | one-off            |
| 6  | Pyramid introduction - 650 people for 1 hour plus 50 hours preparation   | 650                   | 1 + 50 hours | one-off            |
| 7  | Facilitator training courses with 12 people for 4 days                   | 3 courses of 12       | 3 months     | 1 course per month |
| 8  | QIT training for 1 day                                                   | 10 teams of 8         | 1 day        | one-off            |
| 9  | 10 QITs for 6 months with 8 people at 5 hours per month                  | 10 teams of 8         | 6 months     | 5 hours per month  |
| 10 | Training in tools and techniques - 4 depts. per month for 1 hour ongoing | 4 depts of 30 in each | 24 months    | 1 hour per month   |
| 11 | 2 awareness sessions per month for 30 people ongoing                     | 2 lots of 30 in each  | 24 months    | 1 hour per month   |
| 12 | Booklet                                                                  | 1000 copies           | N/A          | one-off            |

### Example two year budget for a firm with 50 employees

|   | Item                                                                     | No of people | Duration     | Frequency         |
|---|--------------------------------------------------------------------------|--------------|--------------|-------------------|
| 1 | TQ co-ordinator at 2 days per week ongoing                               | 1            | 24 months    | 8 days per month  |
| 2 | TQ advisor or consultant at 2 days per month                             | 1            | 12 months    | 2 days per month  |
| 3 | Management seminar - 5 people for 4 hours                                | 5            | 4 hours      | one-off           |
| 4 | Introduction of programme - 50 people for 1 hour plus 10 hrs preparation | 50           | 1 + 10 hours | one-off           |
| 5 | Facilitator training course with 2 people for 4 days                     | 2            | 4 days       | one-off           |
| 6 | 2 QITs for 6 months with 8 people at 5 hours per month                   | 2 teams of 8 | 6 months     | 5 hours per month |
| 7 | 1 awareness session per month for 15 people ongoing                      | 15           | 24 months    | 1 hour per month  |
| 8 | Booklet                                                                  | 70 copies    | N/A          | one-off           |

### Management structure for a TQ programme in a large firm







## A typical organisation and a Total Quality organisation

Below is a comparison of the two types of organisations on issues of quality.

| Quality element                       | Usual organisation                                       | TQ organisation                                              |
|---------------------------------------|----------------------------------------------------------|--------------------------------------------------------------|
| Quality is                            | product orientated                                       | customer orientated                                          |
| Quality priorities are                | less important than cost and schedule                    | first among equals : 'the driver'                            |
| The business focus is towards         | short term gains                                         | medium to long term gains                                    |
| Correction emphasis                   | detection of errors                                      | prevention of errors                                         |
| Costs are                             | raised when quality is emphasised                        | lowered when quality is emphasised                           |
| Errors result from                    | special causes (workers making individual mistakes)      | common causes (ineffective systems and management practices) |
| Responsibility for quality belongs to | the Quality Assurance and Quality Control departments    | everyone                                                     |
| Organisational culture tends towards  | finger pointing, blame finding and punishing risk takers | continuous improvement and rewarding initiative              |
| Organisational structure              | hierarchical and bureaucratic                            | flat and integrated                                          |
| Problem solving is left to            | authority, top of pyramid                                | teams, all employee levels                                   |

## Examples

In a recent survey of construction companies (see Appendix F), of those that had implemented a TQ approach to working, 44% reported cost savings, 25% new customers won and 22% improved staff morale.

The following are some examples given by companies to the TQ task force of benefits they have seen through using TQ.

- ★ Reduced costs - £83 million overall estimated savings against budgeted CAPEX costs of £373 million through design rationalisations
- ★ Less paperwork - 60% less documentation passing between client and contractor with estimated savings of £2.5 million
- ★ Less expediting and inspection giving savings of £2.5 million
- ★ Excellent, non-adversarial, long-term relationship developed with client
- ★ No claims at end of project
- ★ Design period reduced from four to three months
- ★ Work in progress debts reduced from 30% to 18% of working capital
- ★ Faster decision making (due to facilitators)
- ★ Cost reductions of £700,000 over 2 years
- ★ Pride in company
- ★ Small staff turnover
- ★ Operating costs reduced by £3.1 million in 1993 and £0.5 million per year since
- ★ Voluntary psychometric testing used to assemble balanced teams
- ★ Measured improvement in service given to customers
- ★ £35,000 reduction in corporate paperwork
- ★ Theft and vandalism reduced from £9,000 per month to £1,000 per month
- ★ Increased negotiated work from 30% to 60%

Below are some other examples of benefits achieved by companies that have adopted a TQ approach.

- ★ Reduction of waste - £1 million per year
- ★ Wrong dispatches reduced by a factor of five
- ★ Productivity increases of between 10 to 300%
- ★ Process yields up 10%
- ★ Delivery performance significantly increased
- ★ Significant improvement in morale
- ★ Barriers broken down between departments
- ★ Significant suggestion scheme savings
- ★ Ten-fold reduction in number of credit notes issued

## Further reading

The following books contain, to varying degrees, discussions on the merits of TQ.

| <i>Author</i>  | <i>Date</i> | <i>Title and Publisher</i>                                                         |
|----------------|-------------|------------------------------------------------------------------------------------|
| Chase J. G. W. | 1993        | Implementing TQ in a construction company<br>(AGC of America, Washington, DC, USA) |
| Chase R. L.    | 1989        | Winning with quality<br>(IFS Publications, Bedford UK)                             |
| Crosby P. B.   | 1984        | Quality without tears<br>(New York: McGraw-Hill Book Company)                      |
| Deming W. E.   | 1986        | Out of the crisis<br>(MIT Study, Cambridge, Mass, USA)                             |
| DTI            | 1991        | Total quality management and effective leadership<br>(DTI)                         |
| Juran J. M.    | 1980        | Quality planning and analysis 2nd edition<br>(New York: McGraw-Hill Book Company)  |
| Bank J.        | 1992        | The essence of total quality management<br>(Prentice May International, UK)        |
| Oakland J      | 1989        | Total quality management<br>(Heinemann, London UK)                                 |



## 2. Starting your TQ programme

### Planning the implementation of TQ

The TQ implementation plan (page 9) of this manual should aim to complement and build on good ideas and initiatives already running in a company. However, it should be emphasised that a step change is being sought in attitudes.

In a large organisation, the TQ programme should be led by a steering committee who determine policy and make decisions. The programme will eventually involve everyone from every area of the company. It should be two-pronged to involve awareness (including the idea that colleagues are customers as much as external organisations) and specific improvements. Managers should be encouraged to produce personal plans against which personal progress may be monitored.

A TQ initiative will address many of the problems that exist in any company. However, the company must be prepared to see this through the 'flavour of the month' or 'yet another management initiative' stage - it will work but it will also take time. Return on investment will ultimately be high but patience will also be needed.

It must be remembered that the aims of TQ are multiple. These include meeting customer requirements (both internal and external); improving employee satisfaction; reducing errors, rework or omissions, and increasing profits. In order to enable TQ to succeed, a fundamental change in management approach is required to encourage openness and enable empowerment of the staff. A blame-free environment is also required to encourage honesty. This programme has been put together to tackle all these points. It does not exclusively follow the doctrines of any TQ 'Guru' but represents a combination of tried and tested ideas.

*TQ is top initiated but bottom driven*

What is needed :

- ★ Management commitment
- ★ Focused direction
- ★ Business process understanding
- ★ Education and training

## **Starting up TQ**

### **Launch**

The programme needs a high profile launch, the exact details of which need to be determined by the steering committee. It will need to be publicised, for example in a newsletter or on posters, and to be preceded by an initial senior management seminar (including a preliminary quality questionnaire - see Appendix A). This could be introduced by the TQ co-ordinator (e.g., 'Why we need TQ') followed by a presentation given by the TQ advisor on 'How TQ will be implemented'.

It is important that the chief executive is visibly involved in the launch, for example by introducing presentations to show their commitment to the success of the programme. The programme will be launched using briefings to departments by managers supported by the TQ co-ordinator (and, if required, the TQ advisor).

Launching the programme at sites will require a different approach to that used for offices. The message should be tailored to appeal to the concerns, work patterns and culture of site workers, otherwise it will not be taken up.

### **Mission statement**

The mission statement describes the purpose of the organisation. It will be relatively long lasting, changing only when there is a significant shift in either the strategic direction or operating philosophy. The mission statement should provide a coherent, broad description of what the organisation exists for.

For example, 'To meet our clients' needs with quality services that are cost effective, safe and environmentally sound. To provide a working environment for our people that will facilitate quality of work and recognise contribution. To provide our shareholders with a positive return.'

### **Vision statement**

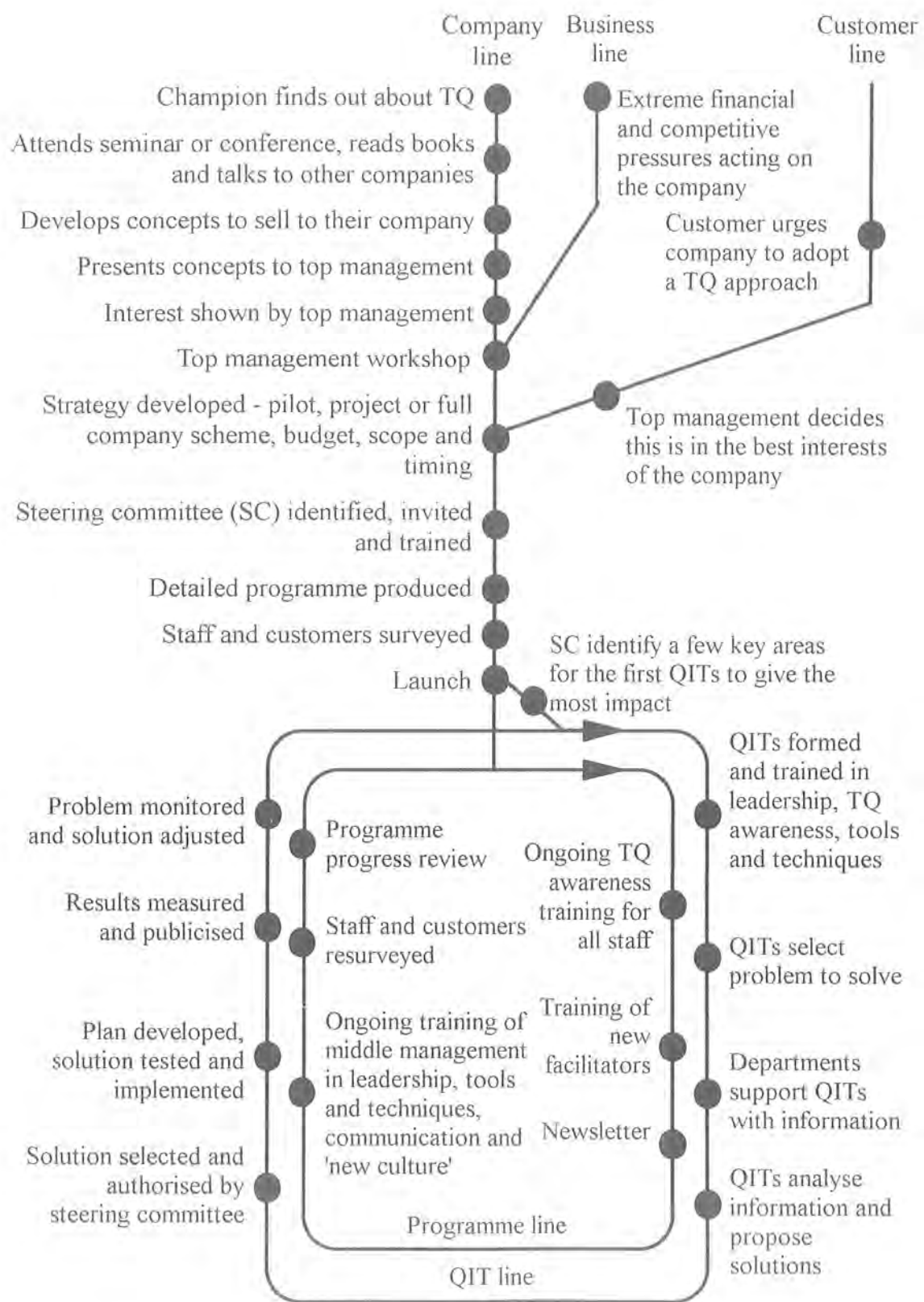
The vision statement is quite simply a description of a desirable, measurable state for the company, set about five to ten years ahead. It will indicate the essential areas in which the company must perform effectively (for example in finance, safety, inventory, etc.) and give broad comparisons of level of performance. Quantification would not appear in the vision statement but in subsequent statements of objectives. The vision statement will not normally include descriptions about 'how' the company will proceed. Vision is about 'where to go', and 'what to be', not about 'how to get there'.

If the company does not yet have either statements, it may be advisable for company senior management to develop and announce them as part of the TQ programme launch.

### **Name**

One of the first jobs of the steering committee will be to name the TQ programme. If possible the word 'quality' needs to be left out and words such as improvement, development, directive, initiative, programme, enterprise, venture, future, change or transformation should be used, for example 'Make the change'. The programme name could also reflect applicable elements of the mission and vision statements.

# Route map to TQ journey from several starts





## Resources

### Steering committee

The first action in the programme must be to identify the steering committee. It is normal for the steering committee to be made up of senior management, and would include the chosen TQ co-ordinator.

The tasks of the steering committee will be to

- ★ show commitment
- ★ define the long term programme and twelve month goals
- ★ allocate resources and money
- ★ produce vision and mission statements
- ★ name the programme
- ★ define the management structure and job titles (see page 11)
- ★ decide who will be involved in supporting the programme
- ★ find two areas for early success
- ★ finalise and be involved in the launch
- ★ review and adjust the programme

The steering committee will meet regularly, typically for two hours per month. No allocation has been made in the example budgets in chapter 1 for committee members' time, as it is assumed this will be absorbed into normal duties.



*The Steering committee must drive the programme around obstacles and pitfalls*



## **Personnel**

The area of resource allocation is one which is most often underestimated in TQ programmes. If care is not taken, the job will expand to fit the resources available. A large company will need initially to invest the equivalent of one person full time. This may be divided between personnel, for example the TQ co-ordinator (supporting the steering committee) may want to delegate some responsibilities. There is a large emphasis on training in TQ, therefore it is proposed that the company's training manager (or an equivalent) also be involved. The programme will be supported by the leaders of the Quality Improvement Teams.

Once the programme is underway and training commences, all staff will be involved to a greater or lesser extent and the appropriate resource made available.

## **Locations**

Two themes are common throughout this TQ programme:- training and meetings. A company embarking upon such a programme will need somewhere suitable for this.

*Small organisations* - A quiet meeting area with facilities for overhead projection for awareness to be used for training and QIT meetings. For events requiring the whole company a local hall or hotel could be hired.

*Large organisations* - Firstly a permanent meeting room dedicated to the programme for eight to ten people with flip chart and writing boards as well as stationery, reference books and the capability for video screening and overhead projection. Then, possibly at a later stage, a larger training facility that could hold up to thirty people at a time.

## Training

Training and education is a very necessary part of the TQ programme; a major investment is needed before any cost savings will start appearing. Costs can be kept to a minimum, and the maximum commitment shown by keeping training in-house wherever possible. Specific areas of training to be concentrated on include TQ introduction and awareness training.

All staff should also receive specific training sessions on tools and techniques, each lasting one hour (these may be included as part of the QIT training). Areas tackled during these sessions may include

- ★ brainstorming
- ★ ranking and rating
- ★ cause and effect analysis
- ★ data analysis
- ★ flowcharting

Extra attention must also be paid to the induction training given to new staff.

Facilitators are vital to the programme and should be trained accordingly. Their four days of training will quickly pay dividends in more efficient meetings and in leading training sessions.

All training should involve elements of team building and improvement techniques and include, wherever possible, a pyramid structure where managers attend one session then are involved in teaching another. This must start at the top with the company senior management.

### Awareness

Awareness of all staff will be improved by lectures and talks given in turn by department heads, perhaps over lunch times. During these sessions, everyone will have the opportunity to find out what goes in other departments and what the implications of their mistakes would be on others.

### Introductory seminars

A number of seminars are to be carried out at the inception of the programme led by the TQ advisor. Their specific content varies according to the attendees (e.g. for company senior management or the newly appointed steering committee). Ideally, these should take place away from the office.

A typical agenda for a steering committee seminar is given below

### **Day One**

| <i>Time</i> | <i>Task</i>                         |
|-------------|-------------------------------------|
| 0800        | <b>Registration</b>                 |
| 0830        | Welcome                             |
| 0845        | Introduction                        |
| 0900        | What is TQ and why use it?          |
| 0945        | Planning the TQ programme           |
| 1015        | Steering committee's role           |
| 1030        | <b>Break</b>                        |
| 1045        | Naming the programme                |
| 1115        | Teams and team leaders              |
| 1145        | Consensus exercise (see Appendix B) |
| 1245        | <b>Lunch</b>                        |
| 1345        | Teams and team leaders (continued)  |
| 1400        | TQ tools and techniques             |
| 1600        | <b>Break</b>                        |
| 1615        | SWOT analysis of company            |

### **Day Two**

| <i>Time</i> | <i>Task</i>                                      |
|-------------|--------------------------------------------------|
| 0800        | Resume of points covered                         |
| 0830        | Problem solving exercise                         |
| 1030        | <b>Break</b>                                     |
| 1045        | Pitfalls and potential hazards                   |
| 1100        | Specific company perceived problems - discussion |
| 1245        | Course review and end                            |
| 1345        | <b>Lunch and close</b>                           |

Quality Improvement Teams need training on the purpose of QITs, teamwork, tools and the problem solving process. All these topics are covered in detail in the ECI workbook *Grow your own Quality Improvement Team*. Below is an example plan for a day's training course for a new QIT, which should be given by the team's facilitator.

| <i>Time</i> | <i>Task</i>                                                                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0900        | <b>Welcome and self introduction by team members</b>                                                                                                                      |
| 0915        | <b>Total Quality</b><br>Open interactive discussion of what the team thinks TQ is<br>Presentation on TQ by facilitator<br>Presentation on the role of QITs by facilitator |
| 0945        | <b>Teamwork</b><br>Introduction to team task - e.g. build a paper tower<br>Team does task<br>Facilitator leads discussion of learning points                              |
| 1045        | <b>Tea/coffee</b>                                                                                                                                                         |
| 1100        | <b>Tools</b><br>Presentation on brainstorming/ranking and rating<br>Team charter exercise<br>Learning points                                                              |
| 1230        | <b>Lunch</b>                                                                                                                                                              |
| 1330        | <b>Problem solving</b><br>Presentation on the five stages of problem solving<br>Team exercise - e.g. How to save time<br>Learning points                                  |
| 1430        | <b>Problem definition</b><br>Problem definition exercise - The Tower of Nod (see Appendix B)<br>Learning points                                                           |
| 1500        | <b>Tea/coffee</b>                                                                                                                                                         |
| 1515        | <b>Problem analysis</b><br>Fishbone diagrams<br>Team exercise - fishbone of 'Why QITs go wrong'<br>Learning points<br>Introduction to teams real problem area             |
| 1630        | <b>Summary of the day and end</b>                                                                                                                                         |

## **Measurement**

### **Introduction**

It is vital that various aspects of the TQ programme are measured in order to establish that real improvements are being achieved. This is to demonstrate to all staff (including senior management) that their investment of resources is showing a real return.

### **Staff surveys**

As described previously, it is important that a baseline survey of staff attitudes is taken close to the formal launch of the TQ programme. By comparison of this with subsequent similar surveys, changes in staff attitudes and understanding and in overall company culture may be identified.

Clearly, survey design and data analysis is critical. Appendix A contains a sample staff questionnaire.

### **Customer surveys**

Just as staff surveys help to identify internal opinion, customer surveys may be used to discover what others think of the company. Clearly, the most important external opinion is that of the organisations and individuals that buy our products and services.

Again, survey design and data analysis are very important, but so is deciding who should be sent a questionnaire. Care should be taken not to skew the sample but commercial consideration must be taken into account.

Included in Appendix A is a sample customer questionnaire.

Section eight of this questionnaire, Comments, is perhaps the most important. Consider asking 'What is the single most important thing we could do to improve our service to you?'

## Typical reporting for survey results

Summarised here are the main features that should be included in a report on survey findings.

### Introduction

- ★ How many questionnaires were sent out?
- ★ Who they were sent out to?
- ★ Why it was decided a survey would be put together?
- ★ How many were returned?
- ★ When will it be repeated?
- ★ Mention that it is being used as a measurement tool, both of attitudes and whether we may improve these attitudes in the future (hence the repeats)
- ★ Mention that this analysis is only an interpretation of the result, and that the results are listed in 'Supplement B' if any individual wants to know more. Further analysis and feedback is encouraged
- ★ Explain why each section is there

### Summary

- ★ One sheet containing all the most obvious findings and what actions need to be taken to improve on them
- ★ Concentrate on positive messages
- ★ Write this last

### Overview

- ★ Top ten to twelve key points with a graph for people who want to be told a little more about the findings than given in the summary
- ★ Write this penultimately

### Analysis

- ★ Make a statement about every question and its answer, backed up by graphs if necessary
- ★ Make the graphs small so that you can fit lots on a page and can write your comments around them. They are meant to illustrate the text, not replace it
- ★ See if the department is affecting the spread of replies
- ★ See whether you can deduce possible reasons for the spread of replies to each question
- ★ Mention all relevant comments and reply to each one
- ★ Use each finding to back up the TQ message, e.g. demonstrating that perceived 'good' areas are not as good as believed. Mention customer-supplier chains

Supplement A.      A blank copy of the questionnaire

Supplement B.      Actual answers

- ★ A list of all the answers so that anyone may go on to do more analysis if they are interested enough
- ★ Write this section first

### **Measurement of problems and solutions**

Having isolated areas for improvement from the surveys the next step is to identify the root causes of the problems. To do this, the underlying processes must be analysed and understood. Use flowcharting to identify the key elements of the process which require improving and consider what can be measured. For example any of the following could be recorded.

- ★ Number of document revisions
- ★ Time spent rectifying customer (internal or external) complaints
- ★ Late deliveries
- ★ Defects
- ★ Plant breakdowns
- ★ Site wastage
- ★ Time between invoicing and payment

Remember one performance indicator may give an incorrect view, three performance indicators for an area under improvement is considered to be the most accurate and cost effective. Realise that all processes have a natural amount of variation, so be sure to measure over a sufficiently long period in order to assess this.

### **Self-assessment of progress**

Finally the measurement of the TQ programme progress is essential both for continued internal planning and then using this information, where applicable, for benchmarking (see chapter 6). The comparison of measures may be made in three areas:

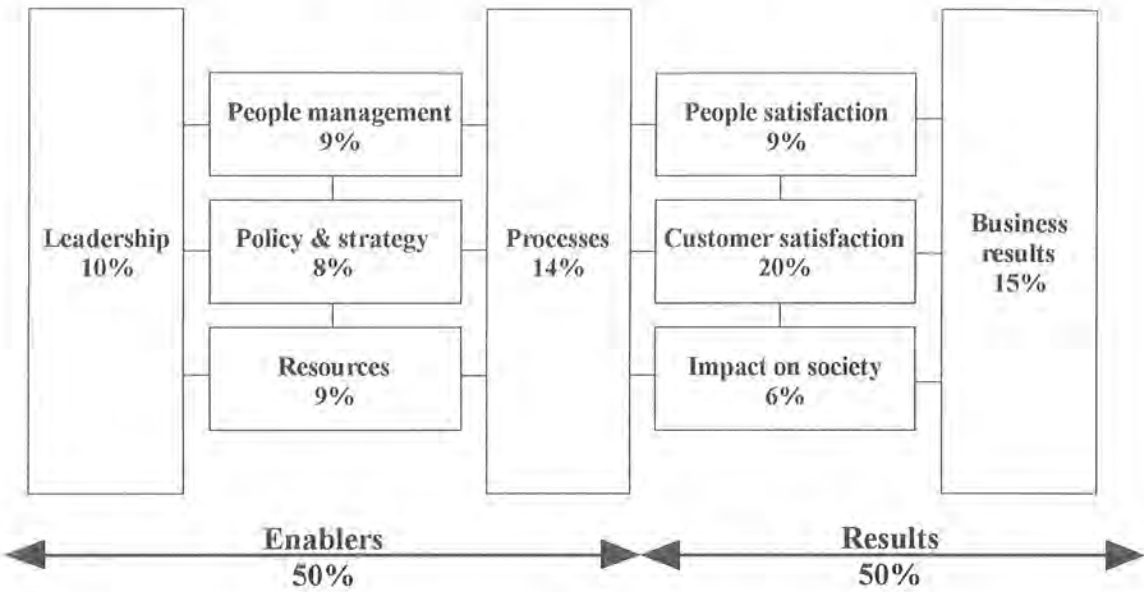
- ★ company business unit to other company business units
- ★ the company's specific performance to other business sector companies
- ★ the company's specific performance to world best in class

**Business excellence models**

These measure the state of Total Quality in an organisation, and are useful to quantify what progress is being made. At a basic level, measurement is done by self assessment.

The Malcolm Baldrige Award was the first model, created for the USA and now also used in other countries. The European Quality Award (EQA) was developed later with an improved section on results measuring. The EQA model is promoted in the UK by the British Quality Foundation (BQF). Organisations with exceptionally high scores (verified by an external assessor) can compete for annual quality awards.

**UK / EQA business excellence model**



The ECI also has a measurement tool, a self assessment matrix (see Appendix C) which was developed specifically for the construction industry. It can be used in all parts of a company from site to the board room, it requires no training and provides a quick snapshot of the state of TQ in the organisation.



## Publicity and feedback

Publicity is critical to the TQ programme as it

- ★ demonstrates to staff that management are committed to the TQ initiative (e.g. an article in first newsletter by the chief executive of the company)
- ★ provides a motivational tool (e.g. photos of the QIT that saved the most money or came up with the first solution to be implemented)
- ★ provides a vehicle for showing to all staff that the effort put into the initiative is having results
- ★ is educational (e.g. booklets on the tools and techniques)

The area of how to publicise the programme and how to provide feedback to everyone about progress and achievements needs to be finalised by the steering committee. However, it could include using newsletters, competitions, posters and displays on notice boards. A booklet could be produced for issue to all staff, detailing how the company is addressing TQ and what may be expected. Future plans could include booklets identifying standard tools and techniques and 'give-aways' such as paperweights and mugs.

## Potential pitfalls while implementing TQ

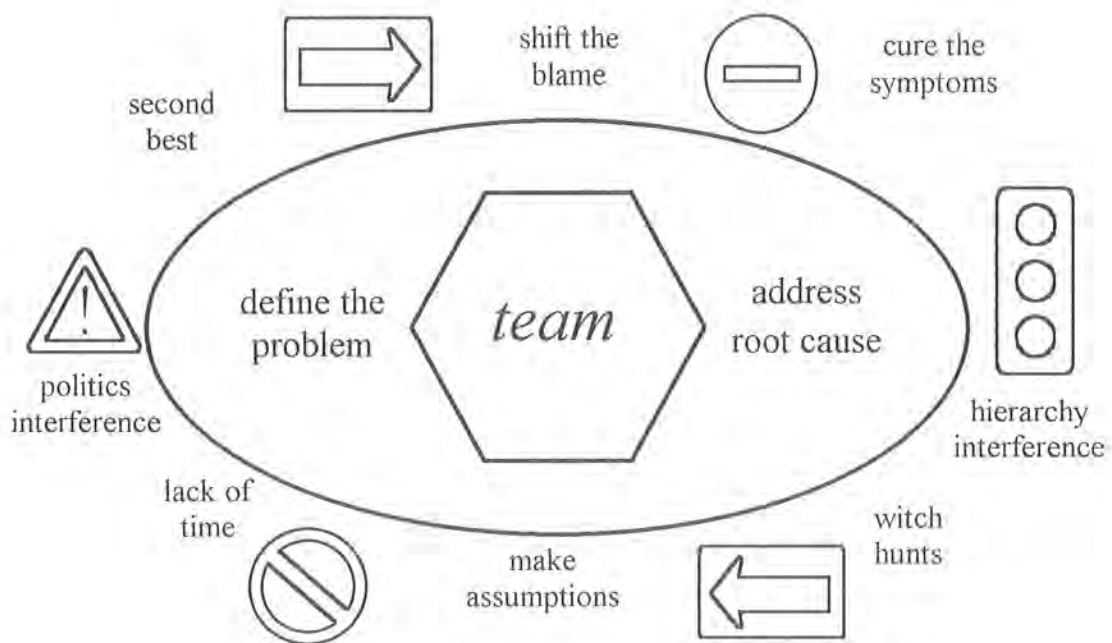
The main pitfall for any TQ programme is losing its momentum. Once an initiative has stopped it will never restart. Therefore it is vital that staff interest is maintained and the successes and benefits achieved publicised, for example in the regular newsletter. Typically after the first two years a new initiative is introduced (e.g. a staff suggestion scheme, if this has not been tried before) in order to recreate some of the excitement of the original launch.

*You don't get a second attempt at TQ* J. Marsh

Management must practice what they preach to show their own and the companies commitment to the programme. There will be sceptics who require plenty of convincing that this is not just another flavour of the month initiative.

Commitment means acting on proposals from quality improvement teams and staff suggestions. Implementing their plans will encourage more ideas and raise morale.

### Pitfalls for any team



## **Appendix A.     Questionnaires**

**Preliminary quality questionnaire** for use in a top management seminar as a starting point to assess the need for TQ.

**Staff questionnaire** for measuring the views, attitudes and morale of employees, and identifying weaknesses and misconceptions in the company.

**Customer questionnaire** to obtain feedback from customers on your product, service and standing against competitors.

- 1) What is the vital element of a TQ programme?
- 2) What is the key benefit to be gained?
- 3) Does your company have a mission, vision or objectives?
- 4) Are these known by all staff?
- 5) How are customer requirements established?
- 6) What monitoring is done of customer problems?
- 7) How are internal customer needs satisfied?
- 8) What monitoring is done of supplier problems?
- 9) How much of your time is spent 'fire-fighting'?
- 10) How much of your company budget is spent on training?
- 11) What is your company communication link from CEO to staff?
- 12) How do you feel your staff would react to a TQ programme?
- 13) What is your company culture?
- 14) Do staff act, and feel, part of a team?

### Essential actions

If there was **one** thing that you feel is not working properly and you would like to change, what would it be?

1) For your company (or holding company)?

2) For your business unit or department?

This survey is to help us with the introduction of Total Quality into the company. It will only take a few of minutes to complete and your replies will be anonymous, although it would help if you identified your department on the last page. Please enter the date you complete it and return it to me when you have finished.

Thank you for your time and assistance.

For answers on a scale of 0 to 10, please circle the one number that represents your views on the topic, basing your answer on the appropriate range given at the start of each section (e.g. 0 = strongly disagree to 10 = strongly agree) or, where a specific range is given in a question, please use this range for that question only (e.g. question 6g).

1. Background

0 = no knowledge or disagree, 10 = expert or agree

- 1a. How well do you understand the requirements of the Quality Standard ISO 9000?  
0 1 2 3 4 5 6 7 8 9 10
- 1b. Do your operating procedures meet this standard?  
Yes No Don't know
- 1c. How well do you understand Total Quality and how it differs from QA?  
0 1 2 3 4 5 6 7 8 9 10
- 1d. Does your department or company work in a Total Quality way?  
0 1 2 3 4 5 6 7 8 9 10
- 1e. How many directors can you name?  
Please enter the actual number or 'All'. \_\_\_\_\_
- 1f. How many directors would you recognise in the corridor?  
Please enter the actual number or 'All' \_\_\_\_\_

2. Quality needs general perception

In a Quality Improvement Initiative, how important do you think the following are?

0 = irrelevant, 10 = essential

- 2a. Involving everyone within the company?  
0 1 2 3 4 5 6 7 8 9 10
- 2b. Everyone working to clear objectives or goals?  
0 1 2 3 4 5 6 7 8 9 10
- 2c. 'Prevention' not 'detection' of problems?  
0 1 2 3 4 5 6 7 8 9 10
- 2d. Company-wide communications?  
0 1 2 3 4 5 6 7 8 9 10
- 2e. Education and training of everyone?  
0 1 2 3 4 5 6 7 8 9 10
- 2f. Continuous improvement?  
0 1 2 3 4 5 6 7 8 9 10

2g 'Right first time?'  
0 1 2 3 4 5 6 7 8 9 10

3. Quality needs

How important do you believe the following to be to staff?

0 = irrelevant, 10 = essential

3a Involving everyone within the company?  
0 1 2 3 4 5 6 7 8 9 10

3b Everyone working to clear objectives or goals?  
0 1 2 3 4 5 6 7 8 9 10

3c 'Prevention' not 'detection' of problems?  
0 1 2 3 4 5 6 7 8 9 10

3d Company-wide communications?  
0 1 2 3 4 5 6 7 8 9 10

3e Education and training of everyone?  
0 1 2 3 4 5 6 7 8 9 10

3f Continuous improvement?  
0 1 2 3 4 5 6 7 8 9 10

3g 'Right first time?'  
0 1 2 3 4 5 6 7 8 9 10

4. Departmental interfaces

0 = strongly disagree, 10 = strongly agree

4a How many other departments do you work with?  
Please enter the actual number or 'All' \_\_\_\_\_

4b Do you think your and their responsibilities are clearly defined with no overlap?  
0 1 2 3 4 5 6 7 8 9 10

4c Do you find other departments helpful and co-operative?  
0 1 2 3 4 5 6 7 8 9 10

4d Do you think other departments find you helpful and co-operative?  
0 1 2 3 4 5 6 7 8 9 10

5. Improving efficiency

0 = very poor or disagree, 10 = excellent or agree

5a How would you rate the efficiency of your department?  
0 1 2 3 4 5 6 7 8 9 10

5b How would you rate the efficiency of the company?  
0 1 2 3 4 5 6 7 8 9 10

5c How would you rate your own efficiency  
0 1 2 3 4 5 6 7 8 9 10

- 5d Do you feel that you would consider help to improve efficiency?  
0 1 2 3 4 5 6 7 8 9 10
- 5e Have you ever read the procedures applying to your dept. (0 = none, 10 = all)?  
0 1 2 3 4 5 6 7 8 9 10
- 5f How well do you remember/do you know what they say?  
0 1 2 3 4 5 6 7 8 9 10
- 5g Do you feel you have had sufficient training for your job?  
0 1 2 3 4 5 6 7 8 9 10
- 5h Do you feel you have had sufficient Quality Assurance training?  
0 1 2 3 4 5 6 7 8 9 10
- 5i Do you feel you have had sufficient Total Quality training?  
0 1 2 3 4 5 6 7 8 9 10
- 5j On joining the firm, did you feel your initial training/familiarisation was satisfactory?  
0 1 2 3 4 5 6 7 8 9 10
- 5k In what year did you join the company?  
\_\_\_\_\_

## 6. Support

0 = strongly disagree 10 = strongly agree

- 6a Are you paid overtime?  
Yes No
- 6b Do you ever do company work in your own time (0 = never, 10 = every day)?  
0 1 2 3 4 5 6 7 8 9 10
- 6c Do you feel you have sufficient support from clerks/secretaries?  
0 1 2 3 4 5 6 7 8 9 10
- 6d Do you feel your department has sufficient support from clerks/secretaries?  
0 1 2 3 4 5 6 7 8 9 10
- 6e Do you feel able to talk freely to your manager?  
0 1 2 3 4 5 6 7 8 9 10
- 6f Do you feel your manager listens to your problems?  
0 1 2 3 4 5 6 7 8 9 10
- 6g What proportion of your work-related problems are solved (0 = none, 10 = all)?  
0 1 2 3 4 5 6 7 8 9 10

## 7. Comments

Please add any further comments or suggestions on an additional sheet of paper.

Department:

Date:



This survey should only take a few minutes to complete and is to help us to improve our service to you. We take your opinion very seriously, as we want to continue with, and build on, our partnership with you.

Thank you for your time and assistance.

For each question, please answer by circling the most appropriate response. For questions to be answered on a range of 0 to 10, please circle one number that best represents your views on the topic, basing your answer on the key given in each section (e.g. 0 = very poor to 10 = excellent).

## 1. About you

Company name:

Date:

Location:

Customer order reference:

Your name:

Your position:

## 2. Pre-delivery

0 = very poor, 10 = excellent

2a. How rapid was our response to your initial enquiry?

0 1 2 3 4 5 6 7 8 9 10

2b. Was the initial information that we provided you with sufficient for your needs?

Yes No Don't know

2c. Was our detailed estimate/quotation delivered to you by the time agreed?

Yes No Don't know

2d. Did the estimate/quotation contain all of the information that you required?

Yes No Don't know

2e. How clear/easy to understand was our estimate/quotation documentation?

0 1 2 3 4 5 6 7 8 9 10

## 3. Equipment delivery

0 = very poor, 10 = excellent

3a. Did we deliver the equipment on the date agreed?

Yes No Don't know

3b. Did we deliver the equipment to the right location?

Yes No Don't know

3c. How rapid was the installation and commissioning process?

0 1 2 3 4 5 6 7 8 9 10

3d. Was the equipment installed and commissioned on time?

Yes No Don't know

3e. Did the equipment meet the agreed specification?

Yes No Don't know

3f How clear/easy to understand was the accompanying documentation (e.g. manuals)?  
0 1 2 3 4 5 6 7 8 9 10

3g Was the accompanying documentation complete?  
Yes No Don't know

3h Was the accompanying documentation accurate?  
Yes No Don't know

3i Was the actual invoiced cost the same as in the estimate?  
Yes No Don't know

#### 4. Operability

0 = very poor or difficult, 10 = excellent or very easy

4a How easy do your staff find the equipment to operate?  
0 1 2 3 4 5 6 7 8 9 10

4b Did this operability meet your expectations?  
Yes No Don't know

4c Did this operability meet the contractual specification?  
Yes No Don't know

4d How rapidly do new operators learn how to use the equipment?  
0 1 2 3 4 5 6 7 8 9 10

4e If we provided training for your staff, how effective was this training?  
0 1 2 3 4 5 6 7 8 9 10

#### 5. Reliability

0 = very poor or difficult, 10 = excellent or very easy

5a How reliable was the equipment?  
0 1 2 3 4 5 6 7 8 9 10

5b Did this reliability meet your expectations?  
Yes No Don't know

5c Did this reliability meet the contractual specification?  
Yes No Don't know

5d How rapid was our response to your requests (if any) for after-sales servicing?  
0 1 2 3 4 5 6 7 8 9 10

5e How rapidly did our servicing staff correct any deficiencies?  
0 1 2 3 4 5 6 7 8 9 10

5f Did our servicing staff correct any deficiencies first time?  
Yes No Don't know

5g How easy do your staff find it to maintain the equipment?  
0 1 2 3 4 5 6 7 8 9 10

5h Did we provide all of the spares that were contractually agreed?  
Yes No Don't know

5i Were these spares adequate for your needs?  
Yes No Don't know

- 5j How quickly do we respond to your requests (if any) for additional spares?  
0 1 2 3 4 5 6 7 8 9 10
- 5k Do we provide additional spares quickly enough?  
0 1 2 3 4 5 6 7 8 9 10
- 5l How reasonable are our prices for additional spares?  
0 1 2 3 4 5 6 7 8 9 10

## 6. Competitors

How do you rate us against our competitors for the following:

0 = very poor, 10 = excellent

- 6a Speed of response?  
0 1 2 3 4 5 6 7 8 9 10
- 6b Communication with you?  
0 1 2 3 4 5 6 7 8 9 10
- 6c Product quality?  
0 1 2 3 4 5 6 7 8 9 10
- 6d Product reliability?  
0 1 2 3 4 5 6 7 8 9 10
- 6e Pricing?  
0 1 2 3 4 5 6 7 8 9 10
- 6f Value for money?  
0 1 2 3 4 5 6 7 8 9 10
- 6g Meeting your requirements?  
0 1 2 3 4 5 6 7 8 9 10
- 6h Resolving any problems?  
0 1 2 3 4 5 6 7 8 9 10
- 6i Recognition of your concerns?  
0 1 2 3 4 5 6 7 8 9 10

## 7. Overall

0 = very poor, 10 = excellent

- 7a How do you rate our overall performance?  
0 1 2 3 4 5 6 7 8 9 10
- 7b Would you use us again for a similar contract?  
Yes No Don't know
- 7c Would you be prepared to recommend us to other organisations?  
Yes No Don't know

## 8. Comments

Please add any further comments or suggestions on a separate sheet.

Thank you once again for your time and assistance.



## **Appendix B. Seminar training exercises**

**Wilderness survival** - A consensus exercise for use at the start of a team building event to help 'break the ice', and to illustrate points for discussion.

**The Tower of Nod** - An exercise for five to thirteen people, highlighting the importance of problem definition and communication skills.

Here are twelve questions concerning personal survival in a foreign wilderness situation. Your first task is to select the best one of the three alternatives given under each item. Try to imagine yourself in the situation depicted. Assume that you are alone and have a minimum of equipment, except where specified. It is autumn. The days are warm and dry, but the nights are cold.

After you have completed this task individually, you will again consider each question as a member of a small group. Your group will have the task of deciding, by consensus, the best alternative for each question. Do not change your individual answers, even if you change your mind in the group discussion. Both the individual and group solutions will later be compared with the 'correct' answers provided by a group of survival experts.

|                                                                                                                                            | Individual | Group |
|--------------------------------------------------------------------------------------------------------------------------------------------|------------|-------|
| 1). You have strayed from your party in trackless woods. The best way to attempt to contact your friends is to                             |            |       |
| a. call 'help' loudly but in a low register                                                                                                | a          | a     |
| b. yell or scream as loud as you can                                                                                                       | b          | b     |
| c. whistle loudly and shrilly                                                                                                              | c          | c     |
| 2). You are in 'snake country'. Your best action to avoid snakes is to                                                                     |            |       |
| a. make a lot of noise with your feet                                                                                                      | a          | a     |
| b. walk softly and quietly                                                                                                                 | b          | b     |
| c. travel at night                                                                                                                         | c          | c     |
| 3). You are hungry and lost in wild country. The best rule for determining which plants are safe to eat (those you do not recognise) is to |            |       |
| a. try anything you see the birds eat                                                                                                      | a          | a     |
| b. eat anything except plants with bright red berries                                                                                      | b          | b     |
| c. put a bit of the plant on your lower lip for five minutes; if it seems alright, try a little                                            | c          | c     |
| 4). The day becomes hot and dry. You have a full bottle of water (about one litre) with you. You should                                    |            |       |
| a. ration it - about a cupful a day                                                                                                        | a          | a     |
| b. not drink until you stop for the night, then drink what you need                                                                        | b          | b     |
| c. drink as much as you think you need when you need it                                                                                    | c          | c     |
| 5). Your water is gone; you become very thirsty. You finally come to a dried-up watercourse. Your best chance of finding water is to       |            |       |
| a. dig anywhere in the stream bed                                                                                                          | a          | a     |
| b. dig up plant and tree roots near the bank                                                                                               | b          | b     |
| c. dig in the stream bed at the outside of a bend                                                                                          | c          | c     |

- 6). You decide to walk out of the wild country by following a series of ravines where a water supply is available. Night is coming on. The best place to make camp is
  - a. next to the water supply in the ravine a a
  - b. high on a ridge b b
  - c. midway up the slope c c
- 7). Your torch grows dim as you are about to return to your campsite after a brief foraging trip. It is dark and the surroundings seem unfamiliar. You should
  - a. head back at once, keeping the light on a a
  - b. warm the batteries under your armpits, and then replace them b b
  - c. shine your light for a few seconds, try to get the scene in mind, move out in the darkness, and repeat the process c c
- 8). An early snow confines you to your small tent. You doze with your small stove going. There is danger if the flame is
  - a. yellow a a
  - b. blue b b
  - c. red c c
- 9). You must ford a river that has a strong current, large rocks and some white water. After carefully selecting your crossing spot, you should
  - a. leave your boots and pack on a a
  - b. take your boots and pack off b b
  - c. take off your pack, but leave your boots on c c
- 10). In waist-deep water with a strong current, when crossing the stream you should
  - a. face upstream a a
  - b. face across the stream b b
  - c. face downstream c c
- 11). Your way ahead is blocked, the only route is up. The rock is slippery and moss covered. You should try it
  - a. barefoot a a
  - b. with boots on b b
  - c. with socks on c c
- 12). Unarmed and unsuspecting, you surprise a large bear prowling around your campsite. As the bear rears up about ten metres from you, you should
  - a. run a a
  - b. climb the nearest tree b b
  - c. freeze, but be ready to back away slowly c c

Here are the recommended courses of action for each of the situations on the wilderness survival question sheet. These answers come from the comprehensive course on woodland survival taught by the Interpretative Service, Monroe County (New York) Parks Department. These responses are considered to be the best rules of thumb for most situations; specific situations, however might require other courses of action.

1. (a) Call 'help' loudly but in a low register.

Low tones carry further, especially in a dense woodland. There is a much better chance of being heard if you call loudly but in a low key. 'Help' is a good word to use because it alerts your companions to your plight. Yelling or screaming would not only be less effective, but might be passed off as a bird call by your friends far away.

2. (a) Make a lot of noise with your feet.

Snakes do not like people and will usually do everything they may to get out of your way. Unless you surprise or corner a snake there is a good chance that you will not even see one, let alone come into contact with it. Some snakes do feed at night, and walking softly may bring you right on top of a snake.

3. (c) Put a bit of the plant on your lower lip for five minutes; if it seems all right, try a little.

The best approach, of course, is to eat only those plants that you recognise as safe. But when you are in doubt and very hungry, you may use the lip test. If the plant is poisonous, you will get a very unpleasant sensation on your lip. Red berries alone do not tell you much about the plant's edibility (unless, of course, you recognise the plant by the berries) and birds just do not have the same digestive systems we do.

4. (c) Drink as much as you think you need when you need it.

The danger here is dehydration, and once the process starts your litre of water will not do much to reverse it. Saving or rationing will not help, especially if you are lying unconscious somewhere from sunstroke or dehydration. So use the water as you need it, and be aware of your need to find a water source as soon as possible.

5. (c) Dig in the stream bed at the outside of a bend.

This is the part of the river or stream that flows the fastest, is less stilted, deepest, and the last part to go dry.

6. (c) Midway up the slope.

A sudden rain storm might turn the ravine into a raging torrent. This has happened to many campers and hikers before they had a chance to escape. The ridge line, on the other hand, increases your exposure to rain, wind and lightning, should a storm break. The best location is on the slope.



7. (b) Put the batteries under your armpits to warm them and then replace them in the torch.

Torch batteries lose much of their power, and weak batteries run down faster, in the cold. Warming the batteries, especially if they are already weak, will restore them for a while. You would normally avoid night travel, of course, unless you were in the open where you could use the stars for navigation. There are just too many obstacles (logs, branches, uneven ground, and so on) that might injure you - and a broken leg, injured eye or twisted ankle would not help your plight. Once the sun sets, darkness falls quickly in wooded areas; it would usually be best to stay at your campsite.

8. (a) Yellow.

A yellow flame indicates incomplete combustion and a strong possibility of carbon monoxide build up. Each year many campers are killed by carbon monoxide poisoning as they sleep or doze in tents, cabins or other enclosed spaces.

9. (a) Leave your boots and pack on.

Errors in fording rivers are a major cause of fatal accidents. Sharp rocks or uneven footing demand that you keep your boots on. If your pack is fairly well balanced, wearing it will provide you the most stability in the swift current. A waterproof, closed backpack will usually float, even when loaded with normal camping equipment; if you step off into a hole or deep spot, the pack could become a lifesaver.

10. (b) Across the stream.

Errors in facing the wrong way in fording a stream are the cause of many drownings. Facing upstream is the worst alternative; the current could push you back and your pack would provide the unbalance to pull you over. You have the best stability facing across the stream, keeping your eye on the exit point on the opposite bank.

11. (c) With socks on.

Here you may pick your route to some degree and you may feel where you are stepping. Normal walking boots become slippery, and going barefooted offers your feet no protection at all.

12. (c) Freeze, but be ready to back away slowly.

Sudden movement will probably startle the bear a lot more than your presence. If the bear is seeking some of your food, do not argue with it; let it forage and be on its way. Otherwise, back very slowly toward some refuge (trees, rock outcrop, etc.)

Below are 26 clues which together give the problem and solution to the Tower of Nod. Cut this sheet up into slips of paper with one clue on each. Divide up the slips between all the participants. The only rule of the exercise is that participants cannot show each other their own clues. The exercise should take about 20 minutes if you allow writing. It is much harder if it has to be done entirely orally.

What day of the week is the tower completed?

Sun rises at Fanti, sets at Yinti

Yinti is eight hours after Fanti

A zing is a tenth of a pasti

Scrasor is the fifth day of the week

Yafü falls between Ninian and Scrasor

Scrasor and Scratchit are the fifth and sixth days of the week

Scratchit, Frenor and Pinti are the final days of the week

Each worker can lay one klink in two hours

There are 100 workers available

Work starts Zanzi, 1st of Pootle

Workers are paid every Frenor

Ninian follows Tobago

Two pasties equal one yonk

Tobago is three days before Scrasor

Yafiti is a religious day, no work is undertaken

Workers work only daylight hours

Zanzi is the first day of the week

There are 32 days in a month

The Tower of Nod is 30 yonks high

One klink measures 1 x 1 x 1 pasti

Workers are paid 2 Dinegs/hour

Base of the tower is 10 x 20 pasties

The first and fourth Pintis in a month are taken off - no work is undertaken

Yafiti, Zanzi, Tobago and Frenor are some of the days of the week

Usires is in charge



## **Appendix C.     ECI measurement matrix**

The matrix is intended to provide organisations, projects, sites or sections with a tool for determining their progress towards the achievement of Total Quality.

There are twelve key objectives that need to be attained before any organisation could be considered to be a TQ company. These are shown along the top of the matrix and each has six levels of attainment. The twelve objectives are not in any order and may be approached individually, however some do naturally follow others.

In developing your own particular TQ process it would be advisable to move ahead on most of the objectives at about the same pace, as otherwise an unbalanced process will develop which in turn cannot be judged as TQ.

The matrix is designed to be located in a visible public place in the work area and marked up to show progress every three to six months. By regularly updating the chart, the unit will identify which of the TQ objectives needs to be concentrated upon to ensure attainment on each remains at a reasonable level. By using a colour coding the rate of improvement will easily be seen.

There are two suggested methods of establishing the scores. The preferred method is for all involved to brainstorm the scores, which gives everyone a chance to understand their meaning and additionally to take ownership of the planned improvements. Alternatively they may be individually scored in private and the results averaged out. This spread of scores would highlight the different perceptions around the unit.

Visibility of the matrix is essential as everyone in the office, project, site or unit needs to see progress and understand how they are able to play their part. It goes without saying that everyone needs to be involved if the TQ process is to be successful.

### ECI Measurement Matrix

|   | <b>C</b> ommitment and leadership by top management at location          | <b>O</b> rganised process and structure for TQ  | <b>N</b> ecessary business performance                | <b>S</b> upplier relationships (internal and external)             | <b>T</b> rainning awareness, education and skills    | <b>R</b> elationships with internal and external customers         |
|---|--------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------|
| 5 | Fully committed and actively leading the process                         | Fully integrated with normal management systems | High performance company meeting or exceeding targets | Active partnering taking place with joint improvement team working | Provides external training to others                 | Active partnering taking place with joint improvement team working |
| 4 | Committed with personal involvement                                      | Fully defined, understood and implemented       | Visible improvement of business performance           | Key staff involved in facilitating relationships                   | Programme fully developed and ongoing                | Key staff involved in facilitating relationships                   |
| 3 | Nominates and supports quality representative at senior management level | Understood and partially implemented            | Realignment of business focus and targets             | Joint expectations reviewed and addressed                          | Programme partially implemented                      | Joint expectations reviewed and addressed                          |
| 2 | Provides spasmodic support and encouragement to quality initiatives      | Defined and partially understood                | Recognition of how to improve business performance    | Recognition of both parties concerns                               | Programme under development budget allocated         | Recognition of both parties concerns                               |
| 1 | Sceptical of benefits                                                    | Fragmented and ill-defined                      | Conscious of some business inefficiencies             | Activities well intended but prone to mis-understanding            | Importance of programme recognised but not initiated | Activities well intended but prone to mis-understanding            |
| 0 | No interest                                                              | Non-existent                                    | Unaware of business inefficiencies                    | Suspicious and defensive                                           | Not recognised as important                          | Suspicious and defensive                                           |

**ECI Measurement Matrix**

| <b>Understanding</b><br>commitment<br>and<br>satisfaction<br>of employees      | <b>Communi-</b><br><b>cations</b>                                        | <b>T</b> eamwork<br>for<br>improvement                                              | <b>I</b> ndependent<br>certification<br>of quality<br>management<br>system<br>(QMS)         | <b>O</b> bjective<br>measurement<br>and feedback                   | <b>N</b> atural use<br>of TQ tools<br>and<br>techniques                 |   |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------|---|
| Culture shows<br>total<br>commitment<br>and<br>enthusiasm for<br>total quality | Established<br>system fully<br>implemented<br>with effective<br>feedback | Improvement<br>teams recom-<br>mendations<br>actioned and<br>results moni-<br>tored | QMS fully<br>documented,<br>implemented<br>and certified                                    | Performance<br>indicators as<br>standard<br>management<br>tool     | Use of tools<br>and<br>techniques<br>comes<br>naturally to<br>all       | 5 |
| Widespread<br>understanding<br>and<br>commitment<br>evident                    | Established<br>system widely<br>used with<br>some<br>feedback            | Successful<br>internal<br>teams active                                              | QMS fully<br>documented<br>and<br>implemented<br>but not<br>certified                       | Continuous<br>regular<br>measurement<br>and analysis<br>of results | Tools and<br>techniques<br>used by<br>some staff<br>most of the<br>time | 4 |
| Possible<br>benefits<br>recognised<br>and some<br>commitment                   | System<br>exists but<br>not fully<br>used                                | Internal<br>teams<br>identified<br>and trained<br>in TQ tools<br>and<br>techniques  | QMS<br>implemented<br>but problems<br>identified by<br>internal audit<br>remain<br>unsolved | Co-ordinated<br>measurement<br>and analysis<br>of results          | Tools and<br>techniques<br>used when<br>reminded                        | 3 |
| Aware but<br>no<br>commitment                                                  | Policy exists<br>but system is<br>disorganised                           | Improvement<br>projects<br>identified                                               | Partial QMS<br>in place.<br>Certification<br>not planned                                    | Regular<br>measurement<br>against<br>targets                       | Key staff<br>have<br>training in<br>tools and<br>techniques             | 2 |
| Culture<br>openly<br>hostile to<br>TQ                                          | Importance<br>recognised<br>but no<br>co-ordinated<br>policy exists      | Team<br>improvement<br>programme<br>established<br>and budget<br>allocated          | QMS<br>planned                                                                              | First<br>performance<br>indicators<br>identified                   | Aware of<br>tools and<br>techniques                                     | 1 |
| Total<br>ignorance<br>of TQ                                                    | No<br>recognition<br>of<br>importance                                    | None                                                                                | No QMS                                                                                      | None                                                               | Unaware<br>of their<br>existence                                        | 0 |

## Achievement assessment

| Score | Management understanding | Progress percentage | Company status                                                                                                                                                                                                            |
|-------|--------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 55-60 | Wisdom                   | 81-100%             | Total Quality in construction. A recognised guru. (Has someone cheated in the marking?)                                                                                                                                   |
| 45-54 | Empowerment              | 51-80%              | A world class construction operation with some improvements still left to make. The majority of employees feel enabled to make improvements                                                                               |
| 33-44 | Enlightenment            | 26-50%              | Realisation that continuous quality improvements have been made and some benefits are visible. Programme needs careful control here or it will falter. Typical time elapsed from start of programme is at least two years |
| 25-32 | Awakening                | 11-25%              | You are seeing the first signs of improvement. Active promotion of continuous improvement is having an effect. A small number of quality champions appearing                                                              |
| 12-24 | Uncertainty              | 6-10%               | Significant line management commitment is needed at this stage to overcome resistance to change                                                                                                                           |
| 0-11  | None                     | 0-5%                | No comprehension of quality as a management tool. Tendency to blame quality control for quality problems. The receiver is knocking at the door                                                                            |



## Appendix D. Sources of advice

Mention is made in chapter two of a TQ advisor. There are a great many advisors selling their skills and services, from the self employed to international consultancies. Expertise, experience and prices vary.

This guide gives a lot of practical information. A reader wanting to start a TQ programme in their company would be wise to seek further advice, either from a consultant or from a company with an existing programme.

The Association of Quality Management Consultants International Ltd (AQMC) has just under 200 registered individuals from large and small organisations. Members must demonstrate their professional competency by their training, qualifications and experience.

*Company secretary, 4 Beyne Road, Olivers Battery, Winchester, SO22 4JW*  
*Tel 0196 - 286 - 4394 Fax 0196 - 286 - 6969*

Many of the large management consultancy firms have experience in helping companies with Total Quality.

The largest and most reputable of the consultancy companies specialising in TQ are also producers of books and documents on the subject.

Trade magazines and journals often contain articles and advertisements by consultancies.

Personal recommendations, especially from companies that have used the consultant are perhaps the best way to find help. The ECI can give details of companies used by members.

## Selecting and using consultants

- ★ Just use the consultant for advice, not to do the job for you
- ★ Beware of those offering a ready made system - every situation is unique
- ★ Maximise the use of your own people, to reduce your reliance on the consultant and also to maximise staff ownership of the final output
- ★ Choose a consultant who has
  - a) experience with your size of company
  - b) experience in your companies industry
- ★ Check references, talk to previous customers'
- ★ The consultant must get to know and understand your business
- ★ You should set out the scope, timetable and aims of the work you wish the consultant to undertake
- ★ Make sure that any quality systems proposed meet the needs of the company first, not the assessing body
- ★ Be sure the consultant has the resources to complete the project
- ★ Consider sharing the consultant with other organisations with similar interests, to cut costs and learn from each other. Some funding is available for small companies for consultancy costs - see Business Links on next page
- ★ Do not buy on price alone

## **Other organisations (primarily for the UK)**

### **Business Links**

Business Links brings together key local business support agencies throughout England to give one-stop access to the full range of services. Each outlet has a number of Personal Business Advisors to serve individual companies. Business Links help diagnose firms' strengths and weaknesses, provide strategic consultancy, and assist with selecting consultants and managing consultancy projects. For details of Business Links operating near you, contact the local Government Office, your nearest TEC or Chamber of Commerce, or call 0114 - 259 - 7507/8

### **TECs and LECs**

Training and Enterprise Councils (known as Local Enterprise Companies in Scotland) provide small firms with information and advice, including quality management training programmes and awareness seminars. For further information contact your local TEC, LEC, Government office or call

*For TECs*      0114 - 259 - 4776

*For LECs*      0141 - 248 - 2700

### **British Quality Foundation (BQF)**

BQF acts to promote the performance and effectiveness of all types of enterprise and organisation within the UK through the promotion of Total Quality. Membership is open to all public and private sector organisations. The BQF offers seminars, conferences, publications, other services and activities - including running the UK Quality Award.

*215 Vauxhall Bridge Road, London, SW1V 1EN*

*Tel 0171 - 963 - 8000*

*Fax 0171 - 963 - 8001*

### **National Society for Quality through Teamwork (NSQT)**

NSQT aims to enable UK companies to continuously improve business performance through the effective use of teamworking. To achieve this, it utilises the experience and energy of its member organisations, currently well over 400. It provides a network of regional meetings, seminars, and conferences for the exchange of experience. It also runs training courses and an advisory service. It maintains links with the European Foundation for Quality Codes and Management Associations, and the Association for Quality and Participation in the USA.

*2 Castle Street, Salisbury, Wiltshire, SP1 1BB*

*Tel 0172 - 232 - 6667*

*Fax 0172 - 241 - 0983*

### **Investors in People UK**

Investors in people is the national standard that provides a framework for improving business performance and competitiveness, through a planned approach to setting and developing people to meet these objectives. It draws on the experience of some of the UK's most successful organisations, both large and small. It therefore provides a comprehensive benchmark of best practice against which an organisation can audit its policies and practice in the development of people.

*4th floor, 7-10 Chandos Street, London, W1M 9DE*

*Tel 0171 - 467 - 1900*

*Fax 0171 - 636 - 2386*



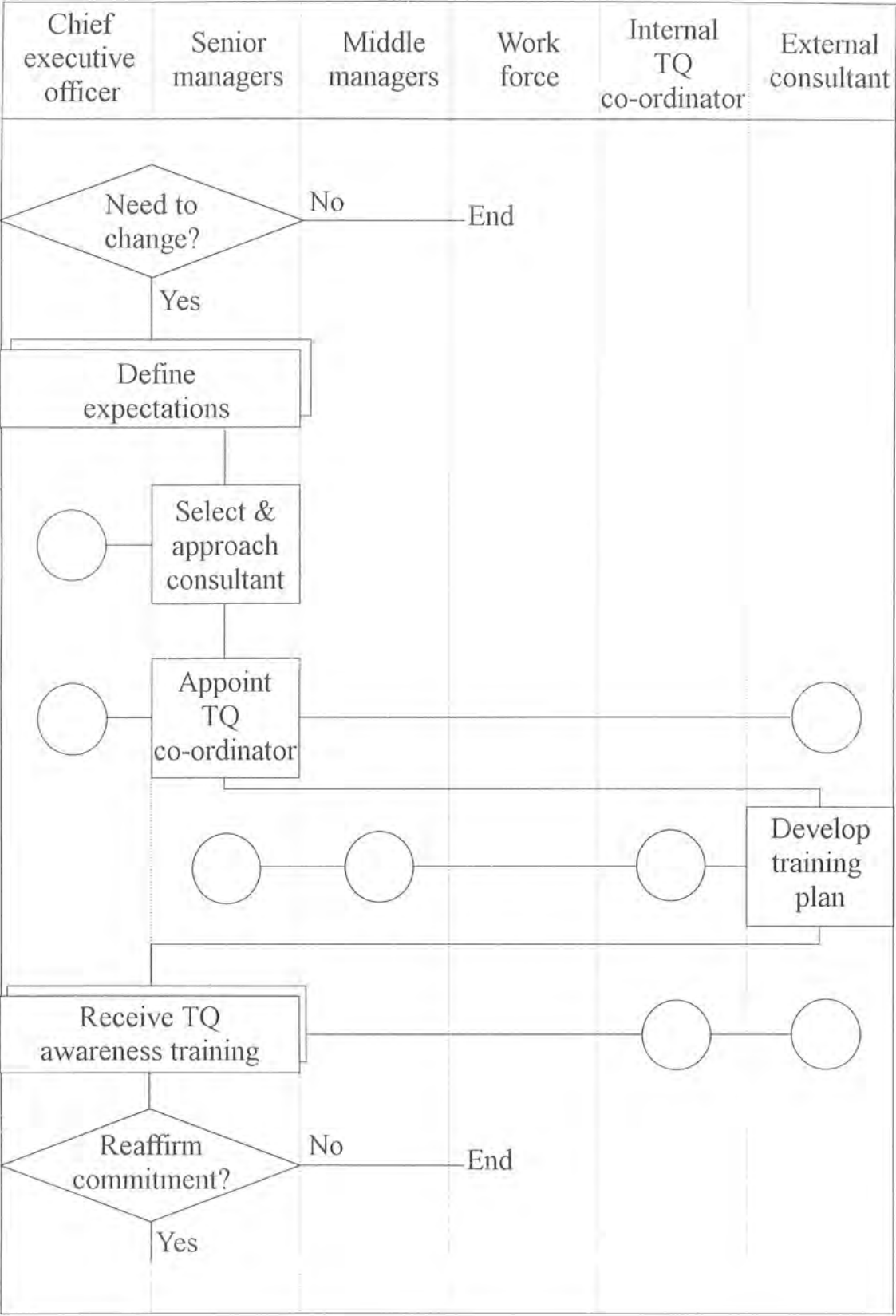
## **Addendum E. Experience from America**

The following diagrams and text are reproduced with the kind permission of the Construction Industry Institute (CII), the equivalent of the ECI in the US. They are the summarised results of research into a large number of American construction companies practising TQ.

### **Phases of the TQ journey**

- ★ **Exploration and commitment**  
Identify need for change and decide TQ is the mechanism
- ★ **Planning and preparation**  
Plan for the TQ implementation process
- ★ **Implementation**  
Begin actual efforts
- ★ **Sustaining**  
TQ becomes part of the normal operation of the firm

Exploration and commitment



## **Exploration and commitment**

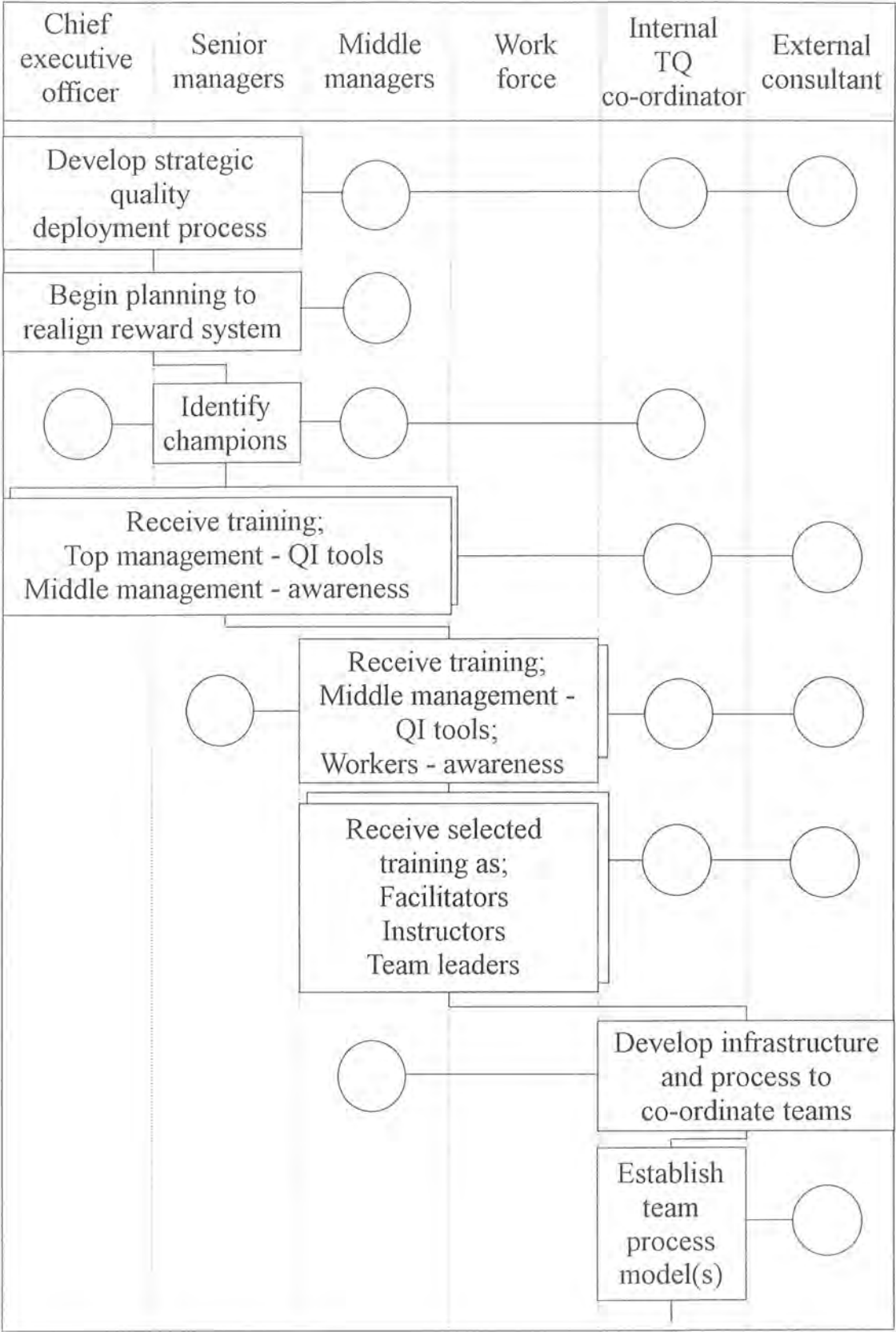
### **Lessons learned - success factors**

- ★ Driven by top management
- ★ Based on perceived need for change
- ★ Decide TQ is the vehicle for change
- ★ Define expectations for TQ
- ★ Use outside consultants
  - TQ experience, industry experience, flexibility
- ★ Appoint an in-house co-ordinator
- ★ Develop a company-wide training plan
  - Critical, costly, requires planning
- ★ Train top management first
- ★ Reaffirm commitment after training

### **Lessons learned - pitfalls and barriers**

- ★ Lack of true top management commitment
- ★ Lack of adequate understanding and preparation by management
  - Example - premature emphasis on measurement without having other elements in place
- ★ Failure to understand and accept the 'total' in TQ
- ★ Failure to implement from top down
- ★ Failure to seek skilled external help

Planning and preparation





## **Planning and preparation**

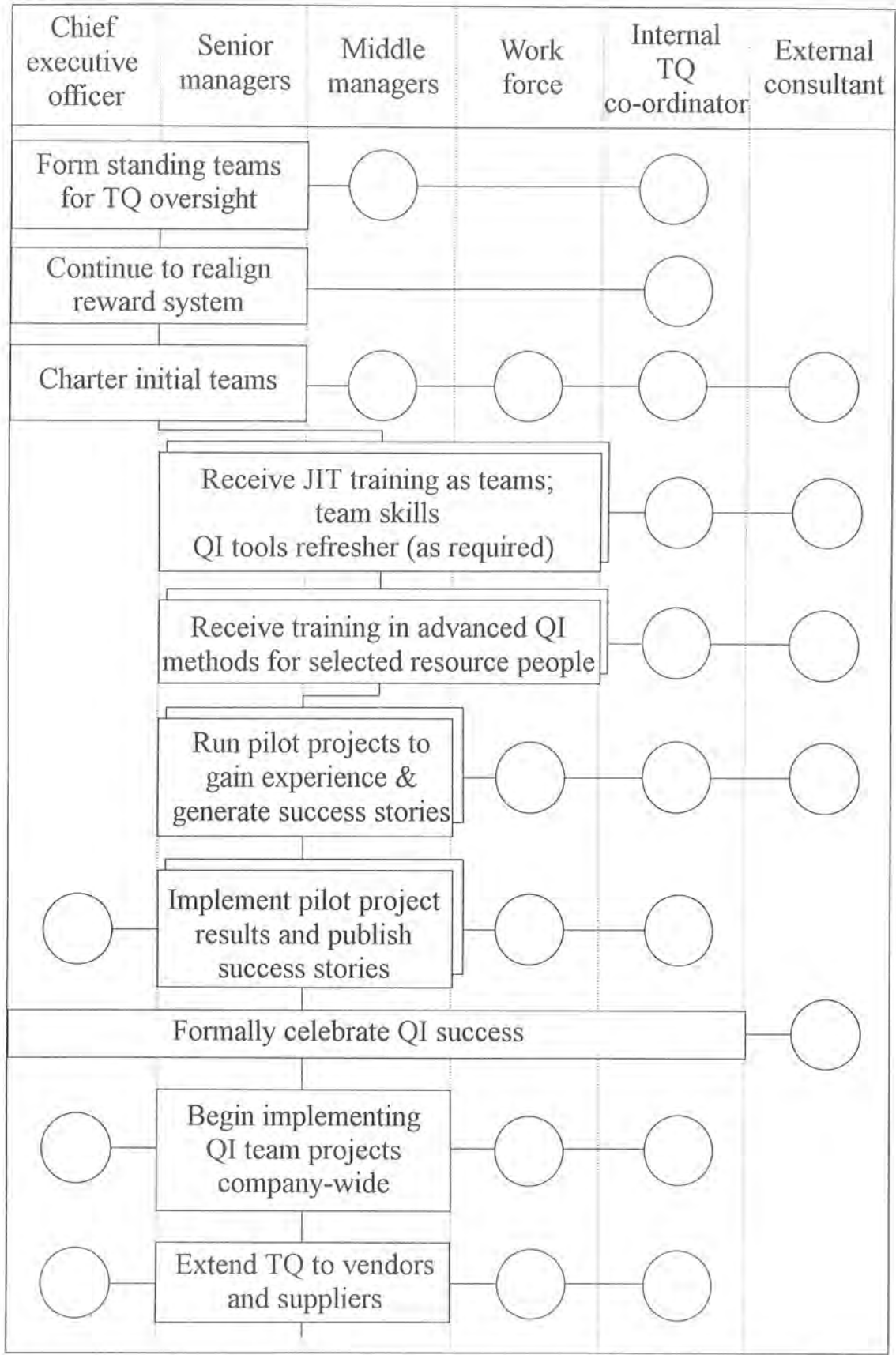
### **Lessons learned - success factors**

- ★ Strategic quality deployment process
- ★ Begin to adjust reward system
- ★ Identify TQ champions
- ★ Cascade TQ awareness and tools training
- ★ Provide special training - facilitators, instructors, team leaders
- ★ Develop a process to manage team formation and efforts
- ★ Develop a model for how the team process functions

### **Lessons learned - pitfalls and barriers**

- ★ No alignment between strategic objectives and team improvement activities
- ★ Reward system does not foster participation in the TQ process
- ★ Out of sequence training - audience, content or both
- ★ Unco-ordinated team activities
- ★ Unstructured team work method

Implementation



## **Implementation**

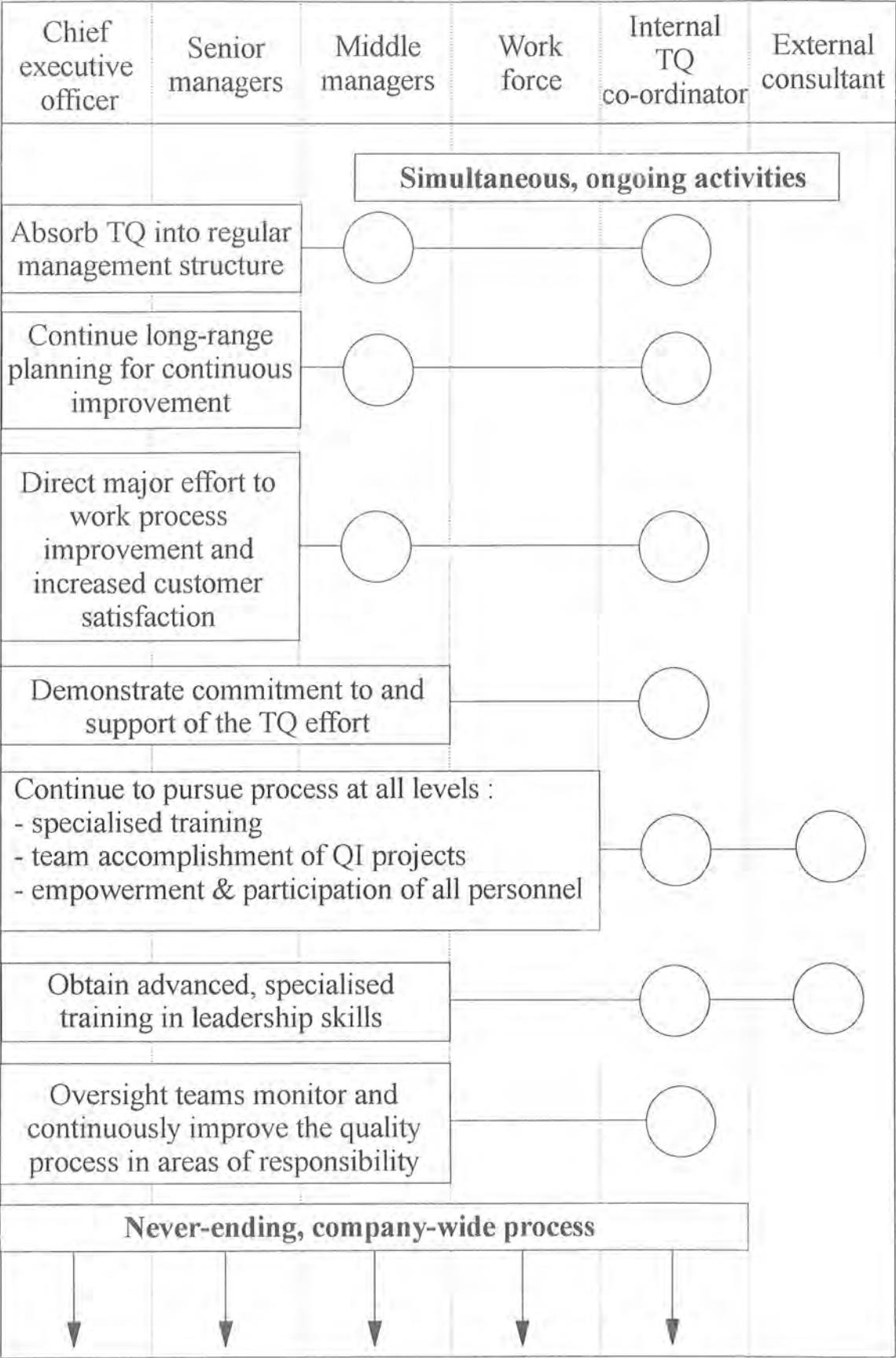
### **Lessons learned - success factors**

- ★ Establish high level oversight teams
- ★ Have formal charters for teams
- ★ Provide just-in-time team skills training
- ★ Pilot improvement projects
- ★ After successful pilots, extend TQ process to other parts of the organisation
- ★ Link with customers' TQ processes
- ★ Extend to suppliers

### **Lessons learned - pitfalls and barriers**

- ★ Failure to manage the overall TQ implementation
- ★ Informal creation of teams without specific charters
- ★ Not providing team skills training just before it is to be applied
- ★ Over emphasis on statistical training
- ★ Premature roll-out of the process
- ★ Failure to involve suppliers and subcontractors

Sustaining



## **Sustaining**

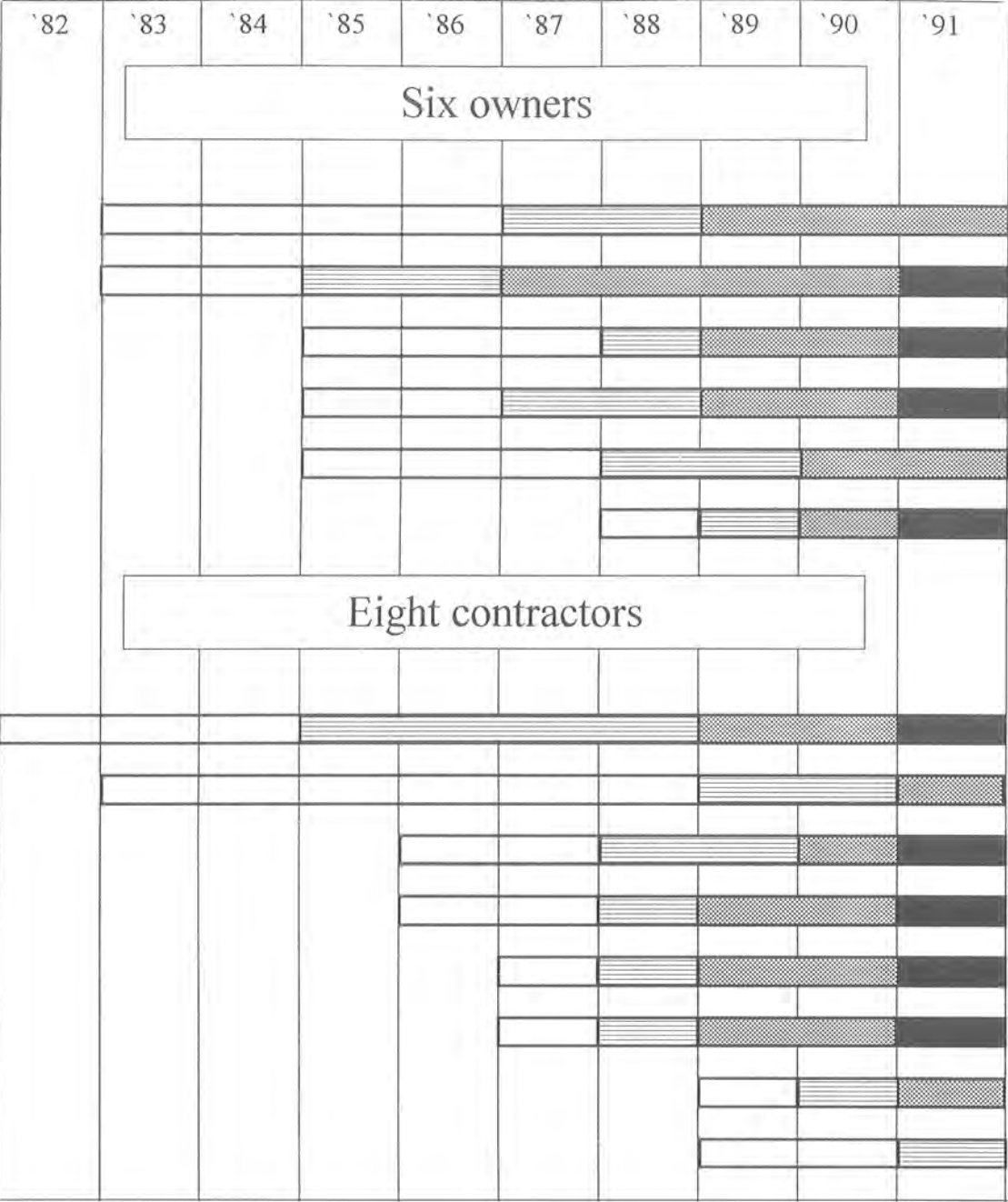
### **Lessons learned - success factors**

- ★ Few companies have reached this phase
- ★ Essential components
  - Continue planning
  - Advanced training
  - Focus on process and customer satisfaction
  - Discipline
- ★ Management's continued personal involvement
- ★ Management's further development of leadership abilities
- ★ Process is continuous

### **Lessons learned - pitfalls and barriers**

- ★ Bypassing the quality process to fight fires and achieve short-term objectives in other than true emergencies
- ★ Considering that TQ is a destination which has been reached and that the journey is over

Approximate durations for phases of the TQ journey



Key

- Exploration and commitment
- Planning and preparation
- Implementation
- (Early) Sustaining

### 3. Culture change

#### Introduction

Total Quality (TQ) is and will continue to be a primary competitive determinant of the 1990s and therefore it is increasingly vital for all businesses, regardless of either size, industry or location, to understand fully the strategic potential of TQ.

The change in company's culture is a key factor in implementing TQ within your company.

The first step is to gain an understanding of the current culture within your organisation, by surveying your own staff with the ECI measurement matrix in Appendix C. The columns on commitment, relationships, understanding, communication and teamwork are especially relevant.

Once you know where you are, identify where you want to go. Top management has to define the company's vision and mission.

When these have been completed, the vision and mission have to be continuously communicated to all levels, both inside and outside the company. The companies strategies should all be designed to meet this goal. The new culture will gradually fall into place but keep measuring so that you know how far you have come along the culture change road

## What is a company's culture?

A company's culture can be defined as having

- ★ shared assumptions
- ★ shared beliefs
- ★ shared values
- ★ shared norms

These drive shared patterns of behaviour, including

- ★ leadership behaviour
- ★ strategic behaviour
- ★ operational behaviour
- ★ decision making behaviour
- ★ information flow behaviour
- ★ managerial behaviour
- ★ supervisor behaviour

Culture and behaviour will differ widely between small and large firms, offices and construction sites. Each situation is unique depending on the environment, work patterns and personalities present.



*What are the ingredients of your company's culture?*



## Why change your culture?



*'Survival is not compulsory'* Dr W. Edwards Deming

### **A common perception of the current position**

The current construction culture is perceived by some as suffering from entrenched attitudes, poor communications, lack of trust and generally adversarial relationships at all levels. Many of the characteristics are rooted in management style and practices which have evolved over the years. Unless the attitudes and behaviours associated with these practices change, there will be no significant progress in improving the situation.

A recent survey conducted by the ECI (see Appendix F) to assist the preparation of this booklet found that 80% of those construction industry companies surveyed who had started TQ, had done so 'to improve openness, communication and working efficiency'. The benefits from those companies who were able to keep up the impetus and change their cultures were that they had made 'large cost savings, won new customers, and improved their employees morale'.

## What is our company all about?

The vision statement is quite simply a description of a desirable, measurable state for the company, set about five to ten years ahead. It will indicate the essential areas in which the company must perform effectively (for example in finance, safety, inventory, etc.), and give broad comparisons of level of performance.

Vision statements will vary between operating companies according to their current performance and the extent of improvement which is being sought. Quantification would not appear in the vision statement but in subsequent statements of objectives.

The vision statement will not normally include descriptions about how the company will proceed. Vision is about 'where to go' and 'what to be' and not about 'how to get there.'

Both the mission and vision statements should be understandable and relevant to every one in the company, avoiding any 'management speak' or 'zealous preaching.'



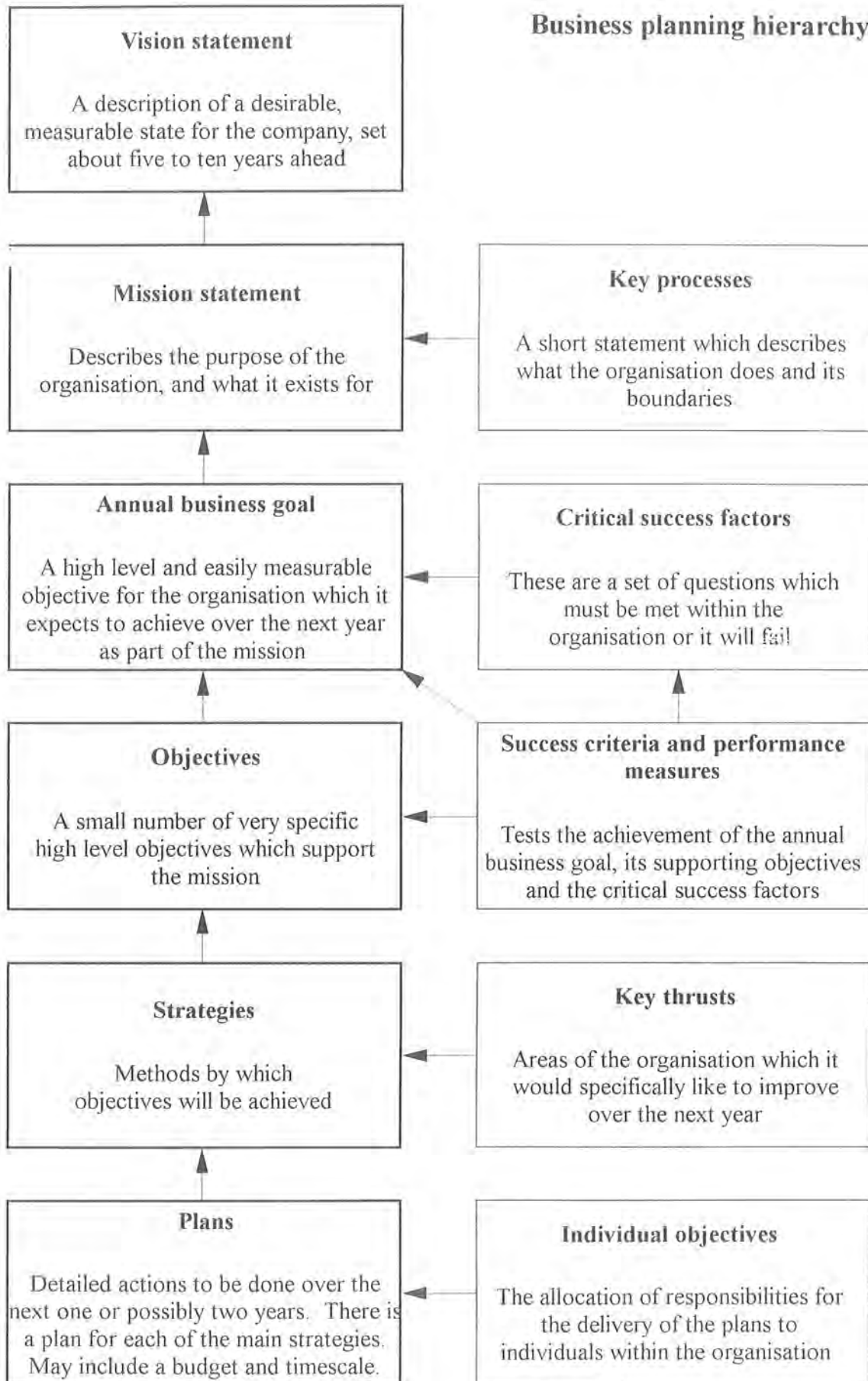
*Questions such as 'What is our company's business?', 'Why are we working this way?' and 'Why do I work for this company?' should be addressed with a vision and a mission statement.*

The mission statement describes the purpose of the organisation. It will be relatively long lasting, changing only when there is a significant shift in either the strategic direction or operating philosophy.

The mission statement should provide a coherent, broad description of what the organisation exists for. However, it is possible to have separate statements for each operating company. The comprehensive, long term nature of a mission statement makes it more suitable as a corporate, rather than localised statement.

For example: 'To meet our clients' needs with quality services that are cost effective, safe and environmentally sound. To provide a working environment for our people that will facilitate quality of work and recognise contribution. To provide our shareholders with a positive return.'

## Business planning hierarchy



## **How to get started: assignments for top management**

### **Vision and mission of the company**

- ★ Take part in creating a simple and uplifting vision and mission statement
- ★ Top management should personally lead this activity by communicating it throughout the company, explaining what the vision or mission is and its relevance to all employees. For example, representative activities would be employee meetings at many locations over the first year, kick-off training sessions, employee newsletters, annual reports, customer meetings, etc.
- ★ Take personal responsibility for sharing the vision throughout the organisation and having it reach everyone. Conduct review sessions with the staff that are designed specifically to determine how well the vision is migrating throughout the organisation

### **Encourage culture change into the planning formats**

- ★ Insist that plans to improve quality and customer or supplier satisfaction are a component of every plan that is developed. This could include strategic plans, business unit and functional staff plans, capital expenditure plans, project plans, etc.

### **Review progress of the plans**

- ★ Operational reviews of progress against plans should be conducted on a bi-annual basis. In any meeting with either an employee or team, review their progress on TQ as part of the meeting
- ★ Over time your role should shift towards that of a coach, assisting your managers, not instructing them

### **Measurement**

- ★ Set a timetable for widening the company's routine measures from purely the financial to include customer or supplier satisfaction, employee morale and key processes
- ★ Sponsor a cross-functional team with the task of developing a two to three year plan to align recognition and reward on the achievement of goals and business successes

### **Successful symbolic activities tried by some companies**

- ★ Lead cross functional team discussions on the barriers to change within the organisation
- ★ Casual wear in the office (without compromising safety) on at least one day per month, except when meeting outside customers
- ★ Events to celebrate achievement

### **Continue your own learning**

- ★ Invite other companies who have changed their culture in to talk to your management team
- ★ Work with your key suppliers with a view to a partnership or alliance agreements.
- ★ Benchmark your key processes against those of leading companies
- ★ Work to overcome potential barriers within the organisation

# Potential barriers

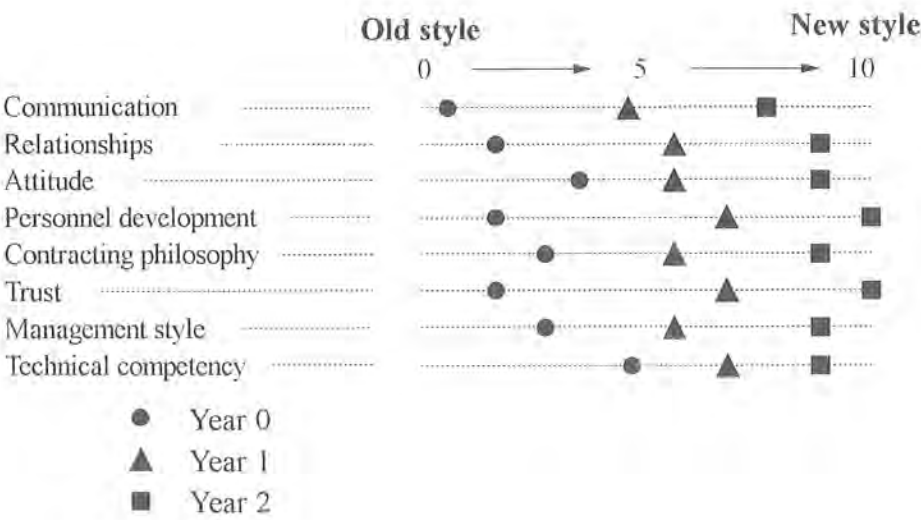
In a recent ECI survey of the construction industry, the participants were asked to identify specific problems associated with changing the culture within the industry.

Most of the respondents recognised these potential barriers stopping change within their companies

- ★ Internal communication
- ★ Blame culture
- ★ Functional bureaucracy
- ★ Long standing practices
- ★ Organisational structure
- ★ Convincing staff of its worth
- ★ Use of agency staff
- ★ Short termism
- ★ Project culture

However, these issues are generic to industry at large and are not specific to the construction industry. They are all surmountable given commitment, persistence and the right tools, as demonstrated by the changed cultures present in a few other industries.

You could use a continuum for each of the styles in culture, determining where the company is at present and then mapping out where it wants to be.



Recognise that trust plays an important part in changing a company's culture from one of blame and finger pointing to one of mutual respect. The continuum shown below could be used as a tool to assist senior management in making that change.



The development areas can be improved through a continuous programme of staff education and training (see chapter 4).





## **Appendix F.     TQ survey**

During the course of researching this handbook, the questionnaire overleaf was sent out with a covering letter. The aim was to obtain an outline of the views and current position of TQ in the construction industry and to check that this handbook was addressing the real issues.

In all, 97 questionnaires were sent out to 87 ECI members (21 overseas) plus 10 representative small companies. 54 replies were received, 50 with usable data and 4 returned uncompleted for a variety of reasons.

## ECI TQ questionnaire

- 1) Where is your company on the TQ road?
- ☐ Attained/pursuing (delete as applicable) Quality Standard \_\_\_\_\_ (e.g. ISO 9000).
- ☐ Not started, but considering it (Go on to question 6).
- ☐ Just starting.
- ☐ Started \_\_\_\_ years ago.
- ☐ Not started, and not considering it because; \_\_\_\_\_
- 2) Why did you start TQ? \_\_\_\_\_ (Go on to question 6).
- ☐ Cost savings.
- ☐ To improve openness, communication and working efficiency.
- ☐ To improve staff morale.
- ☐ Driven by \_\_\_\_\_ (e.g. Chief Executive).
- ☐ Urged to by a customer.
- ☐ To win new customers.
- ☐ Other; \_\_\_\_\_
- 3) What problems have you had?
- ☐ Convincing top management.
- ☐ Changing the company culture (please give details); \_\_\_\_\_
- ☐ Keeping up the impetus.
- ☐ Other; \_\_\_\_\_
- 4) What change/benefits have you seen?
- ☐ Cost savings; \_\_\_\_\_
- ☐ Improved staff morale.
- ☐ New customers won.
- ☐ Other; \_\_\_\_\_
- 5) How many of these tools do you use;
- |                                 | Not at all               | A little                 | Often                    |
|---------------------------------|--------------------------|--------------------------|--------------------------|
| Brainstorming .....             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ranking and Rating .....        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pareto Analysis .....           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Flow Charting .....             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Training Workshops .....        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Benchmarking .....              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Staff Surveys .....             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Customer Surveys .....          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Quality Improvement Teams ..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- 6) What is your approximate number of employees? \_\_\_\_\_
- 7) What is your approximate turnover? \_\_\_\_\_
- 8) What is your main business? \_\_\_\_\_
- 9) Any comments you may have? \_\_\_\_\_

Thank you for your time, please return the completed questionnaire in the envelope supplied.

## Results analysis of ECI TQ survey

### 1) Where is your company on the TQ road?

- 39/50 = 78% attained or pursuing a Quality Standard (ISO9000/1 in 95% of replies)
- 9/50 = 18% not started, but considering it
- 3/50 = 6% just starting
- 29/50 = 58% started on average 4.3 years ago
- 9/50 = 18% not started, and not considering

### 2) Why did you start TQ?

- 17/32 = 53% cost savings
- 28/32 = 88% to improve openness, communication and working efficiency
- 6/32 = 19% to improve staff morale
- 14/32 = 44% driven by - chief executive or managing director in 85% of cases
- 3/32 = 9.4% urged to by a customer
- 9/32 = 28% to win new customers
- 11/32 = 34% other

### 3) What problems have you had?

- 4/32 = 13% convincing top management
- 21/32 = 66% changing the company culture
- 22/32 = 69% keeping up the impetus
- 9/32 = 28% other

### 4) What change or benefits have you seen?

- 14/32 = 44% cost savings
- 7/32 = 22% improved staff morale
- 8/32 = 25% new customers won
- 19/32 = 59% other

### 5) How many of these tools do you use

|                           | Not at all | A little | Often |
|---------------------------|------------|----------|-------|
| Brainstorming             | 1/32       | 11/32    | 20/32 |
| Ranking and Rating        | 10/32      | 15/32    | 7/32  |
| Pareto Analysis           | 18/32      | 10/32    | 4/32  |
| Flow Charting             | 6/32       | 12/32    | 14/32 |
| Training Workshops        | 5/32       | 6/32     | 21/32 |
| Benchmarking              | 7/32       | 18/32    | 7/32  |
| Staff Surveys             | 7/32       | 15/32    | 10/32 |
| Customer Surveys          | 3/32       | 15/32    | 14/32 |
| Quality Improvement Teams | 3/32       | 09/32    | 20/32 |



## 4. How to involve employees

The following structured programme has been piloted by a number of diverse teams with positive results. The aim of the programme is to begin changing the culture of the company, starting by involving small team(s) of employees. A full case history of the results of one of these teams is provided in Appendix H.

The key to the programme is that under the guidance of their team leader and with the help of a facilitator, the team will develop their own views of what effective leadership, teamwork and communication is all about. From these views they will produce a team charter defining the ground rules for effective team-working. Using the ground rules, the team will select and define a problem, analyse root causes, develop a plan and implement it to solve the problem. Teams may either be the normal working group, or a team brought together for a specific task.

The programme provides supporting guidelines to enable the facilitator to brief the team on the essence of a Total Quality approach. This includes how to use appropriate Total Quality tools in their work. The developing team skills in using these tools and the identification and use of individual team member skills in observation, charting, time-keeping, etc. will add significant value to team-working.

Ideally the team will have the services of a trained facilitator, who can also handle several other teams at the same time. If no trained facilitator is available, a team member with good interpersonal or observation skills can be asked to undertake the role. They would need to read and understand the following structured programme and guidelines. Further help to the volunteer may be available through the ECI, who are considering establishing a list of available trained facilitators. These could be contacted for advice and may also be available to act as mentors or even to fulfil the facilitator role for an appropriate fee.

To carry out the problem solving implementation phase of the programme, the team would benefit from using the ECI workbook *Grow your own Quality Improvement Team*. This workbook covers all the stages of this structured programme in more detail, and continues with implementing solutions, checking they work and the future.

The programme is divided into four stages

- ★ Setting up the team
- ★ Team ground rules
- ★ Select and define the problem
- ★ Develop the problem solving plan

For each of the stages, the guidelines start with a flowchart, which includes approximate durations for each of the steps (without an experienced facilitator increase durations by 50%). This is followed by more expansive notes based round slides. Miniature versions of the slides are included in the text, with A4 versions collected in Appendix G.

## Setting up the team

| No. | Duration | Step                                                                           | Responsible                       | Slides |
|-----|----------|--------------------------------------------------------------------------------|-----------------------------------|--------|
| 1   | 1 hour   | Identify and invite individuals to be the team leader and facilitator          | Company sponsor / TQ co-ordinator | -      |
| 2   | 1 hour   | Brief them on the programme. Give them this book and support material          | Company sponsor / TQ co-ordinator | 1-8    |
| 3   | 2 hours  | Team leader and facilitator develop their contract                             | Team leader and facilitator       | 7      |
| 4   | 1 hour   | Team leader and facilitator agree team members                                 | Team leader and facilitator       | -      |
| 5   | 3 hours  | Invite team members to participate, ideally by individual discussion or letter | Team leader and facilitator       | -      |

The estimated total duration for setting up the team is eight hours. A week or so will probably be needed to check replies and finalise the team members before going on to the next stage.

## Slide 1 - What is a facilitator?

As shown on the slide, the definition of a facilitator in a Total Quality context is:

Someone who can enable the organisation to develop the TQ process. This is achieved

- (i) by equipping individuals with TQ skills, including TQ tools and techniques
- (ii) by demonstrating ways in which these can be applied or adapted to make improvements

both in their own activities and, in combination with others.

**Definition of a facilitator**

Someone who can enable the organisation to develop the TQ process. This is achieved;

- i) by equipping individuals with TQ skills, including TQ tools and techniques; and
- ii) by demonstrating ways in which these can be applied or adapted to make improvements;

both in their own activities and in combination with others.

Slide 1

## Slide 2 - What is the role of a facilitator ?

The facilitator's role is to support the team, leader and members, by acting as an 'expert resource'. They are there to assist and coach the team, not to dictate or instruct, and require developed communication and interpersonal skills and influencing abilities.

There is a training element to the role and, in the initial phases of a TQ programme, training will be a substantial part of the facilitator's responsibilities. However, they are not just a trainer. Nor are they someone who takes responsibility for the organisation's improvement activity.

A role which develops as the TQ programme gains maturity is that of the consultant. The facilitator does not answer everyone's quality problems and does not 'do TQ' for everyone else. They should strive to create a climate which enables others to become effective in the improvement process.

**What is the role of a facilitator?**

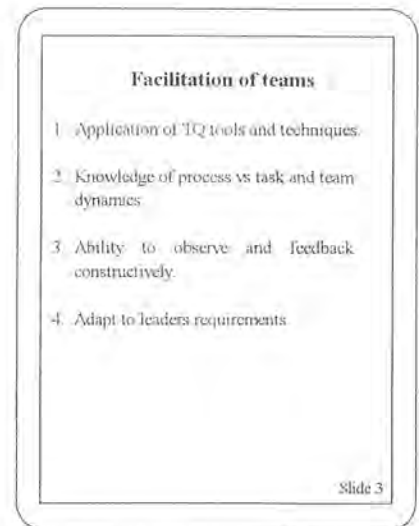
- 1. To support and enable the team.
- 2. Not to be just a trainer
- 3. Not to be responsible for all improvement activity.
- 4. To act as a consultant
- 5. Not to answer everybody's quality problems or to 'do TQ' for everyone else
- 6. To strive to create a 'TQ' climate.

Slide 2

### Slide 3 - How to facilitate improvement teams

In the context of this programme the facilitator should be knowledgeable of the tools and techniques that the team is likely to use - the principles and the practice (including ways of adapting them to the team or task). In addition, the facilitator should be aware of the way the team works together (team dynamics) and how they go about tackling tasks (process). They need to have good objective observation skills. Finally the facilitator must be able to use observation to provide constructive feedback; to help reinforce positive behaviour and to improve less helpful behaviour.

The facilitator should work with the team leader to prepare for team meetings and ensure that during meetings the team remains focused both on the task and the process. In general (and with the prior agreement of the leader) the facilitator should be prepared to intervene, with positive suggestions, e.g., TQ tools, to unblock delays or deviations, to encourage win/win solutions, resolve conflicts and gain consensus. See slide 7 - Contract with the facilitator.



### Slide 4 - Responsibilities of a team leader

- ★ Day to day management of the team, including keeping a focus on their objective and managing conflict.
- ★ Ensuring that TQ principles, tools and techniques are applied and the facilitator's skills are used.
- ★ Ensuring the team achieves the project objectives.
- ★ Demonstrating commitment to the TQ process.
- ★ Identifying and building on team members skills.



Refer to slide 8 - Leadership aspects of management



## Slide 5 - TQ leader's style

As with the facilitator, the TQ project leader should exhibit a coaching/mentoring style. Encouraging co-operation between team members and supporting the style by personal example is the key. The leader should make clear that all members of the team have a role, with responsibilities to each other and to the success of the team. Delegation of functions is a key way of encouraging participation - electing chartists, timekeepers, etc.

Effective communication and sharing of all relevant knowledge is another paramount requirement of team building. TQ demands clear standards, objective measures, and effective recognition of the involvement and achievement of members.

Refer again to Slide 8 - Leadership aspects of management.

**Management style**

1. Coaching and mentoring
2. Encouraging team co-operation - ensuring good communication, supported by personal example
3. Ensuring all team members are aware of their roles and responsibilities, and recognising such involvement and achievement
4. Emphasis on clear standards and measures

Slide 5

## Slide 6 - Customer focus

The concept of customers and suppliers is central to an effective TQ programme. The leader should ensure that team members are aware that, even within the team, they are probably all likely to be both suppliers and customers of information, services, etc. They should be clear about their customer's requirements and their own responsibilities in meeting those requirements.

This is another key area where the leader can emphasise the need for, and effect of, good interpersonal skills.

**Customer focus**

1. Recognition of customer and supplier chains, internal and external
2. Ensuring all team members are aware of their roles in this respect and the responsibilities in meeting requirements

Slide 6

## Slide 7 - Contract with the facilitator

The facilitator is there to help the leader fulfil the team's objectives. They have a different role to the leader, and the relationship requires discussion and agreement between them, prior to team meetings.

The relationship is often referred to as a contract, which rightly implies some formality in the arrangement. An effective TQ programme is one where planning and structure are vital foundations. Hence agreement between the leader and facilitator as to what each expects of the other is an important factor.

Some of the requirements a leader may have of a facilitator are

- ★ to help plan team meetings and what TQ tools to use
- ★ to observe the effectiveness of the meetings process
- ★ to observe and intervene to assist the process
- ★ to provide training in new TQ tools or to refresh training

Two examples of team leader/facilitator contracts follow.

### Example 1 - Leader/facilitator contract

1. To plan the structure of meetings together. The leader and facilitator will share the work of preparing and co-ordinating each meeting, processing the results and considering how these can be used as the basis for progress.
2. The leader will steer the meeting in a direction that will best suit the project requirements. In doing this they will be receptive to feedback from the facilitator.
3. The facilitator will provide the meeting with explanations and coaching on how the different TQ processes work and will lead the meeting in performing the exercises. The facilitator will also act as an observer and will endeavour to assist the leader in achieving his objectives.
4. Both will be aware of the group behaviour and will endeavour to stimulate group response and feedback. The facilitator will lead in providing constructive feedback and reinforcement of positive behaviour. Each will provide the other with feedback after the meeting.



## **Example 2 - Leader/facilitator contract**

### **1. Planning**

In advance of each meeting the leader and facilitator will jointly plan and prepare,

- ★ the structure, including clear objectives
- ★ the facilitator's role and involvement (see 2 below)
- ★ agree the processes to be used

using behaviours conducive to the team charter.

### **2. Team leader**

The leader is to ensure that the team charter is followed, and steer the group appropriately should difficulties arise, seeking advice from the facilitator and the team.

### **3. Role of the facilitator**

The facilitator is to have the option of participating as a team member in each meeting, as a contributor of relevant information.

#### *Appropriate interventions*

- ★ Significant deviations from the team charter which are unhelpful to the team
- ★ Where the facilitator considers the use of a particular tool would help the team to progress
- ★ When requested to do so by the leader or the team

#### *Style of intervention*

The facilitator is to exercise judgement as to the most appropriate method of intervention - whether to bring to the attention of the whole team or to inform the leader discretely.

### **4. Observation**

The leader is to develop methods to obtain and record observations from the team and the facilitator, including

- ★ what went well
- ★ what difficulties had to be overcome
- ★ individual feelings
- ★ helpful hints, do's and don'ts for the leader/facilitator role

### **5. Review**

The leader and facilitator are to review and adjust their contract in pursuit of continuous improvement, and record the changes made.

## Slide 8 - Leadership aspects of management

Most western managers are effective in getting things done, but the grid indicates that this is only a quarter of what an effective leader demonstrates - and is not really leadership but 'merely administration'. Leaders should be using their head, heart and hands as well as their feet.



## Team ground rules

| No. | Duration   | Step                                                                            | Responsible               | Slides     |
|-----|------------|---------------------------------------------------------------------------------|---------------------------|------------|
| 6   | 1.5 hours  | Team briefing - programme outline and TQ awareness presentation.                | Team leader / facilitator | 9-12       |
| 7   | 1.5 hours  | Introduce brainstorming, classifying, ranking and rating tools.                 | Facilitator               | 13-22      |
| 8   | 1 hour     | Brainstorm teamwork, leadership and communication.                              | Team                      | 13-16 + 23 |
| 9   | 0.75 hours | Classify, then rank and rate output of brainstorm - identify top three of each. | Team                      | 17-22      |
| 10  | 0.75 hours | Develop a team charter - ten statements of agreed team behaviour.               | Team                      | 24         |
| 11  | 1 hr       | Review charter, and introduce team roles (observer, chartist etc.).             | Facilitator               | 25-32      |
| 12  | 1 hr       | Brainstorm potential tasks to use as a vehicle to develop team and T&T skills.  | Team                      | 13-16      |

Estimated total duration for team ground rules is 7.5 hours. Ideally, this whole stage could be covered in a one day workshop (see ECI workbook *Grow your own Quality Improvement Team*). Allow a week before beginning the next phase to allow the team to 'mull over' potential tasks.

## Background

TQ has its roots in the USA during the Second World War. Dr Edwards Deming's use of statistical process control techniques with a focus on only undertaking 'necessary processes' was accepted in the war economy of the US. A post-war America, with the world's market at its feet and a demobilising army who needed to find work, found less need for Deming's methods. Instead he turned to Japan who welcomed his approach to performance measurement aimed at effectiveness as well as efficiency. The rest is history. Deming was followed by other TQ gurus such as Crosby and Juran. In the US, Tom Peters alerted American industry to the revolution across the Pacific and in the UK people like John Oakland started to advocate the need for change in European management.

There are now a large number of consultants advising an ever increasing number of companies how to change in order to stay in business and prosper.

## Slides 9 - What is Total Quality?

Total Quality has been well defined as 'continuously meeting customer requirements at lowest cost, by releasing the potential of all employees'.

Slide 9 expands on this with five bullet points:

- ★ The customer sets the standards
- ★ Reducing total costs by persistently eliminating errors
- ★ Continuously improving the performance of all activities
- ★ Utilising the creativity and skills of every employee
- ★ Only doing what is required to meet customer needs, and adds value not cost



The second and third points are subtly different. One points at seeking and eliminating current errors, while the other is wider, looking for ways of improving current processes or better alternatives.

## Slide 10 - Total Quality: the big picture

### What does it mean?

Total Quality depends upon many activities, systems and behaviours, but put simply, TQ stresses the importance of the following four elements.

#### 1) *Customer*

Agreeing customer requirements. Emphasising that customers are both internal and external to the company, department/function, project, etc. The requirements can take the shape of a product, project scope, specification, or an individual's personal objectives. Implicit in this is also the requirement to understand and improve the customer-supplier relationships.

#### 2) *Cost*

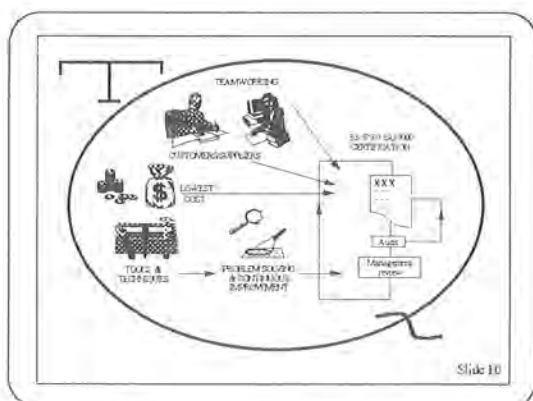
Minimising costs through increasingly effective and efficient processes, cutting down on waste, rework and non value-adding processes. Not through the sacrifice of customer requirements or jeopardising safety.

#### 3) *Human resources*

Developing all employees as individuals, and in their team roles, in order to release their full potential.

#### 4) *Continuous improvement*

Continuously reviewing working practices and procedures, and providing an environment in which ideas for change are encouraged, respected, rewarded and acted upon. Recording best practices in the form of procedures for the benefit of others in the organisation.



These ideas, and their interaction, are displayed in slide 10, which also shows that the procedures, systems and accreditation for ISO 9000 are only one element within the Total Quality environment.



## Slide 11 - What it is, and isn't, about.

This slide seeks to capture the essence of TQ: leadership, customer focus, planning and measuring performance, working smarter not harder, getting the best out of everyone, and looking for achievement and not just activity.



## Slide 12 - Destination or journey?

Striving to work in a Total Quality environment is often described as a continuous journey. Having reached your original goals, through the continuous improvement process, you should then reset to a different and more ambitious goal, and so the cycle continues.

**Learning to work in a TQ way can be equated to learning to drive.**

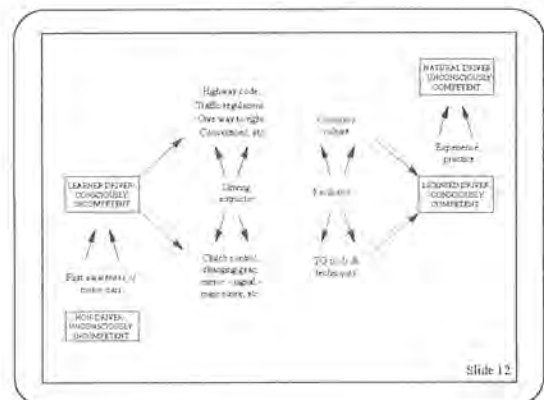
At first we are aware of the concept of driving but are not capable of doing so until we have received instruction - we are unconsciously incompetent.

As we first take lessons we realise a level of unco-ordination, lack of control, and become consciously incompetent.

We go on taking lessons and the requirements of mind and body to perform the task become clearer, with practice we are able to begin to control the vehicle. With further practice (and usually some luck) we pass our driving test, having reached an accepted standard of achievement - we are consciously competent. At this stage the process of driving is still thought about very carefully - mirror, signal, manoeuvre!

Once we have been driving for some time we become practised and confident and the change of gears or movement from lane to lane become part of a natural process, not consciously thought out - we have become unconsciously competent.

In the same way, it is only by understanding, practising and applying our TQ knowledge that we can fully transfer into the natural TQ culture.





### Slide 13 - Brainstorming : uses.

Brainstorming is a deliberately uninhibited technique used to generate ideas in quantity, e.g., possible causes of problems or solutions to problems, for later analysis, evaluation and investigation. As a technique it encourages lateral thought and can be used particularly well for breaking down complex issues.

**Brainstorming**  
Used to:

- ★ Generate a list of problems
- ★ Identify possible causes
- ★ Identify possible solutions
- ★ Develop action plans

Good for:

- ★ Complex problems
- ★ Involving those affected
- ★ Lateral thought

Slide 13

### Slide 14 - Brainstorming rules

**Brainstorming rules**

- ★ No discussion of ideas
- ★ Everyone to contribute
- ★ Problem definition displayed
- ★ Lots of ideas
- ★ Positive encouraging atmosphere
- ★ Allow time for thought
- ★ Accept every idea, no matter how crazy

Slide 14

The right team should be around five to seven strong, and be composed of those involved in the issues being addressed. A leader should be appointed to run the session, remind others of the rules and ensure everyone participates.

The session should be held in an appropriate atmosphere (comfortable undisturbed room with flipchart). The problem or issue to be tackled should be clearly written up, and a large quantity of ideas generated and recorded without criticism. Participants can either shout out ideas as they think of them, or give ideas in turn round the room.

Time for thought before the session is always useful, and incubation periods, effectively a break from the session, can also be productive.

## Slide 15 - The role of the leader

The leader's role is to control both the brainstorming process and the session.

### **The leader's role in brainstorming**

To ensure

- ★ Everyone understands the problem clearly
- ★ Not everyone talks at once
- ★ Rules and times are kept to
- ★ The energy of the session is maintained
- ★ Ideas are coaxed from everyone present
- ★ All ideas are recorded, and without alteration or abbreviation

Slide 15

## Slide 16 - Using the output

Brainstorming sessions should result in the generation of a large number of ideas. To reduce this number to a manageable level, techniques such as grouping, categorising and prioritising could be used.

Start to look at grouping common ideas, checking them against the problem definition, identify where further thought or explanation is necessary. Advice on prioritising using ranking and rating techniques is given in the next ten slides.

### **Using the output of a brainstorm**

- ★ Allow a few days for reflection and new ideas to generate
- ★ Remove any clearly ridiculous ideas
- ★ Classify ideas into groups
- ★ Expand / revisit any groups lacking ideas
- ★ Order the ideas by referring back to the problem - use Ranking and Rating tools

Slide 16

## Slide 17 - What is ranking and rating?

As mentioned previously, there is a need to select action areas from a number of brainstormed ideas. Ranking and rating techniques provide an objective, structured approach to prioritising these ideas.

Each idea or option is given a score (i.e. is rated) for each of a number of chosen criteria. Scores are multiplied to produce a total, on which the ideas are sorted into a list from the highest score to the lowest (ranking).

### What is ranking and rating?

A structured process for sorting ideas or options into an ordered list according to a number of chosen criteria.

Usually a two part process where ideas or options are given scores for each of the criteria (rating), then listed from highest to lowest final scores (ranking)

Slide 17

## Slide 18 - Why use ranking and rating ?

### Why use ranking and rating?

- ★ Extremely flexible tool
- ★ A simple structured way of making difficult decisions
- ★ Multiplying the scores together differentiates between the closest options
- ★ Allows all involved to 'have a say', increasing their ownership of the decisions made through consensus
- ★ Focuses the group on decisions, and away from circular decisions

Slide 18

This slide seeks to illustrate the benefits of the techniques in terms of flexibility, maintaining objectivity, creating consensus and increasing ownership of the results through a group approach.

## Slide 19 - Criteria

The number of criteria should be sufficient to differentiate between options and no more - the more complex the process the longer it will take. As a guide, for between five and fifty ideas, two criteria will be adequate.

### Ranking and rating criteria

The number of criteria should be sufficient to differentiate between options and no more. As a guide for between 5 and 50 ideas, two criteria will be adequate. Commonly used pairs of criteria include:

- ★ Effect and influence
- ★ Consequence and probability
- ★ Essential and desirable

Slide 19

## Slide 20 - Effect and influence

Slide 20 shows an example of how to rank and rate using effect and influence criteria. Consider the fourth row, reducing the amount of information in a bid will have a strong effect on the time taken to produce the bid, but the team only has a small amount of influence over the information that goes into a bid, most of it is requested by the customer.

Consequence and probability criteria may be used in a similar manner.

### Effect and influence criteria for ranking and rating ideas

Goal: To reduce time taken to prepare bids

| Option                       | Effect | Influence | Total | Rank |
|------------------------------|--------|-----------|-------|------|
| Increase No. people involved | 6      | 5         | 30    | 3    |
| Increase / pay overtime      | 5      | 4         | 20    | 5    |
| Reduce No. of bids sent out  | 8      | 4         | 32    | 2    |
| Reduce information in bids   | 8      | 3         | 24    | 4    |
| Increase productivity        | 8      | 7         | 56    | 1    |
| Eliminate delays             | 4      | 3         | 12    | 6    |

Slide 20

Slides 21 and 22- Essential and desirable criteria

This is slightly different method than the others in slide 19.

Each option is evaluated against a list of essential and desirable properties. Those not having all the essential properties are eliminated. The remaining options are ranked on their scores for the desirable properties.

| Essential properties method of ranking and rating ideas |        |        |        |        |        |  |
|---------------------------------------------------------|--------|--------|--------|--------|--------|--|
| Property                                                | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 |  |
| Planning permission                                     | ✓      | ✓      | ✓      | ✓      | ✗      |  |
| Sufficient area                                         | ✓      | ✓      | ✓      | ✓      | ✓      |  |
| Near major road                                         | ✓      | ✓      | ✓      | ✓      | ✓      |  |
| Available local labour                                  | ✓      | ✓      | ✓      | ✓      | ✓      |  |
| Stable ground conditions                                | ✓      | ✗      | ✓      | ✓      | ✓      |  |
| Outcome                                                 | ✓      | ✗      | ✓      | ✓      | ✗      |  |

Slide 21

In this example the desirable properties have been given a weighting: instead of marking out of the usual ten, the options are marked out of the weighting number.

| Desirable properties method of ranking and rating ideas |           |        |        |        |
|---------------------------------------------------------|-----------|--------|--------|--------|
| Property                                                | Weighting | Site 1 | Site 3 | Site 4 |
| Area tax concessions / grants available                 | 5         | 5      | 5      | 0      |
| Supplies and raw materials available locally            | 8         | 6      | 5      | 5      |
| Existing water, gas and electricity supplies            | 6         | 2      | 4      | 6      |
| Near large customers                                    | 4         | 3      | 2      | 0      |
| Existing road to site                                   | 2         | 2      | 0      | 2      |
|                                                         | Total     | 18     | 16     | 13     |

Slide 22

4 How to involve employees

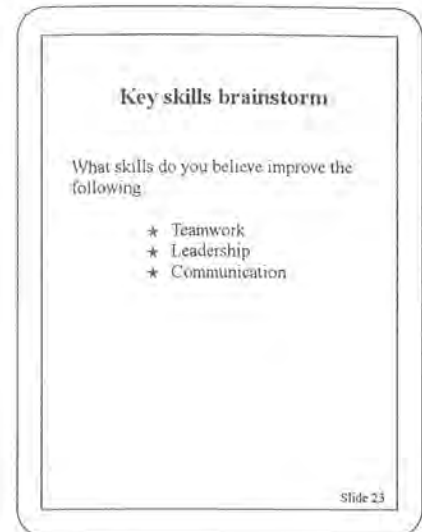
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## Slide 23 - Key skills

In terms of improving the way organisations work there appear to be three key skills that the whole organisation would need to understand and consistently work to better. To promote understanding of the concepts, teams should brainstorm what they believe improve the following three key skills:

- ★ Teamwork
- ★ Leadership
- ★ Communications

This is the first step to understanding what skills are necessary to ensure productive group working.



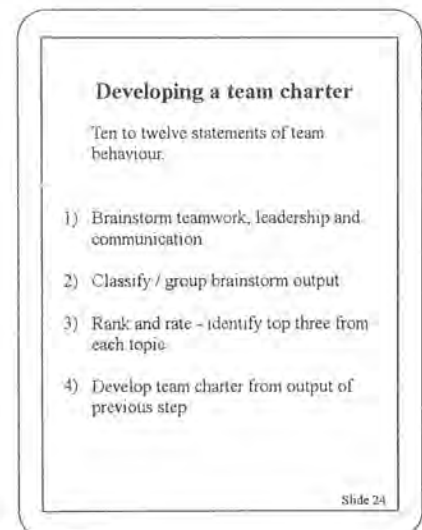
## Slide 24 - Team charter

In order to promote teamworking (group unity, group focus and group motivation), and to understand what particular needs your team may have, one of the first things a team should do is agree a team charter.

In the context of this project it is suggested that teams brainstorm teamwork, leadership and communication, as described above, and prioritise a top three to four from each.

These nine to twelve skill elements can then be worked into a charter (essentially a set of behavioural rules) by translating the elements into the sort of behaviours that the team would expect from its participants in order to work productively together.

Three examples of a team charter follow.



### **Example 1 - Team charter**

- 1) When one person is talking everyone else will listen. Individual contributions should usually be three minutes maximum.
- 2) Decisions made will be shared with others outside the team as appropriate.
- 3) Individual contributions will be accurate, concise, open, relevant, timely and helpful.
- 4) The team is aware of the objectives and is responsible for decisions.
- 5) All team members will be enthusiastic and adaptable contributors.
- 6) All team members will be co-operative - recognising the needs of the team and of those within it.
- 7) The team is given direction and encouragement.
- 8) Skills and expertise of individuals are recognised and utilised.
- 9) The team will keep to their timetable and their agenda.

## **Example 2 - Team charter**

### *The*

- Trust** and respect one another
- Encourage** constructive debate
- Accept** and value individual strengths and weaknesses
- Motivate** each other

### *will*

- Achieve** best practices
- Communicate** clearly and concisely
- Harmonise** effort
- Innovate** and incubate ideas
- Encourage** flexible working
- Value** the development of team members through training
- Establish** a 'no blame' culture

### *by collective*

- Lead** by example
- Empower** through delegation
- Aim** to satisfy the needs of the organisation and its members
- Develop** listening skills
- Evaluate** and prioritise workloads
- Realise** the vision
- Share** responsibilities between the team
- Harness** TQ tools and techniques
- Identify** and remove barriers to communication
- Promote** equal opportunities

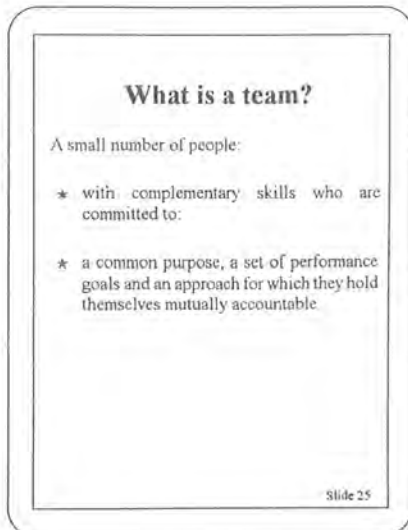


### Example 3 - Team charter

As a team and individually we will

| What                              | How                                                                                                                                                              |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set clear objectives              | Brainstorm, rank and rate, ask 'why' five times, set success criteria and measures.                                                                              |
| Identify and use team strengths   | Cross train, experiment, encourage and support participation.                                                                                                    |
| Manage time effectively           | Prioritise, share work, appoint timekeeper.                                                                                                                      |
| Operate honestly and openly       | No hidden agendas, share ideas and information, welcome new ideas, be approachable.                                                                              |
| Listen and support one another    | Supportive body language, facial expressions, co-operate, help and encourage.                                                                                    |
| Use a facilitating approach       | Coach, empower, use appropriate TQ tools, a facilitator and observer.                                                                                            |
| Communicate clearly and concisely | Be objective, relevant, timely, face-to-face, two way, interesting. Use plain English, avoid jargon, think before speaking and pre-plan any major communication. |
| Give supportive feedback          | No blame culture, constructive criticism, regular analysis by team versus team charter based on observations, test comprehension.                                |

## Slide 25 - What is a team?

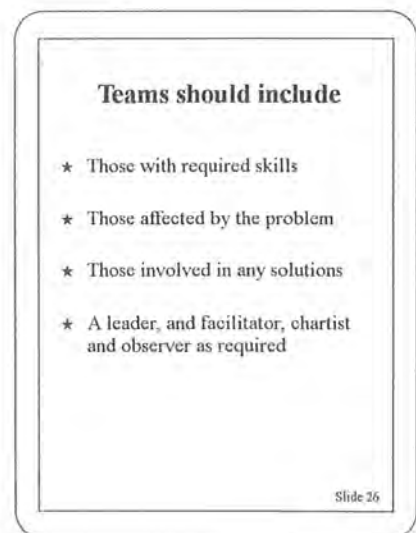


Effective teams will have

- ★ an agreed team task
- ★ complementary skills, experiences and personalities
- ★ a set of performance goals to which they are mutually committed
- ★ measurement of their performance
- ★ recognition of their inter-dependence and the need for mutual support
- ★ between five and eight members for optimum team dynamics
- ★ clear and directed leadership

## Slide 26 - Teams should include:

- ★ Those with the required skills, such as leadership, innovative ideas, pipe stress expertise
- ★ Those directly affected by the problem, and who thoroughly understand it
- ★ Those who may be involved in implementing any solutions
- ★ Roles should include  
leader, facilitator, observer, chartist and (possibly) a time keeper



## Slides 27 and 28 - Observer skills

**Helpful team behaviours**

- ★ Objective setting
- ★ Encouraging involvement and contributions
- ★ Being positive and looking for common ground
- ★ Active listening
- ★ Maintaining focus on the objective or task
- ★ Summarising progress and looking for consensus - win/win positions

Slide 27

To aid teams, observers should be able to recognise helpful and unhelpful behaviours. Observers need both to notice behaviours and to feedback to the team constructively

The leader should develop methods to obtain and record observations, including

- ★ what went well and what difficulties had to be overcome
- ★ helpful hints, do's and don'ts for the leader and facilitator.

On the next page is a suggested observer comments sheet.

**Unhelpful team behaviours**

- ★ Dominance by individuals
- ★ Ignoring or interrupting contributions from others
- ★ Wandering discussions without focus
- ★ Destructive criticism, provocation of others

Slide 28

| Observer's sheet                                                      |
|-----------------------------------------------------------------------|
| Evidence of structure, process and objective setting within the group |
| Evidence of behaviours which unite the group                          |
| Evidence of behaviours which focus the group                          |
| Evidence of behaviours which motivate the group                       |

## Slide 29 - Tips on giving feedback

When feeding back to the team, observers should apply these tips, so the message is constructive and accepted.

**Tips on giving feedback**

- ★ Focus feedback on specific descriptions of behaviour in the context of the group discussion.
- ★ Consider the needs of the person receiving not your own.
- ★ Limit feedback to behaviours the receiver is capable of modifying.
- ★ Check for understanding to make sure the message is clear.
- ★ Focus feedback on sharing information rather than 'imposing advice'.

Slide 29

## Slide 30 - Chartist skills

The chartist should be able to record faithfully (usually on a flipchart) the views of team members quickly, accurately and legibly.

This means that they should not interpret members' statements or ideas, nor abbreviate unless this is agreed and the abbreviation is understood by all.

A true test would be to photo-reduce the flipchart size notes onto A4 paper, and see whether someone who wasn't at the session is able to understand what was discussed.

**The chartist's role in a team**

To record the teams views

- ★ quickly
- ★ accurately
- ★ legibly

without

- ★ interpretation
- ★ abbreviation

Slide 30

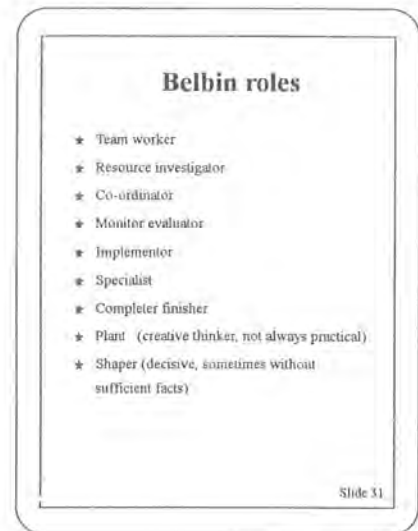
## Team dynamics

Within a team, individuals will take on certain roles depending on their character, and on those of the other team members.

### Slide 31 - Belbin roles

A tool to assess what role someone would naturally play in a team is the Belbin questionnaire (*available from Belbin Associates, 52 Burleigh Street, Cambridge, CB1 1DJ Tel: 0122-336-0895*). The output from this questionnaire is a profile of the person in terms of nine roles; for example 75% resource investigator, 20% shaper and 5% co-ordinator. This person would naturally play the role of a resource investigator, but if a more dominant team member took on this role, they could be a shaper.

When selecting teams be aware that a team with large numbers of one type (e.g. three shapers or three co-ordinators) will not usually work well. A balance of individuals with complementary strengths and weaknesses will be the most productive.



### Slide 32 - Team phases

No team works perfectly from day one. It takes time for members to find their place in a team.

Teams develop through four loose phases:

- ★ **Forming** - weighing each other up
- ★ **Storming** - members jostle to find their position in the team
- ★ **Norming** - settling into positions
- ★ **Performing** - team settled, energy focused on task

A certain amount of conflict is usual (especially during the storming stage), and if handled correctly can be constructive.



## Select and define the problem

| No. | Duration | Step                                                                         | Responsible | Slides |
|-----|----------|------------------------------------------------------------------------------|-------------|--------|
| 13  | 2 hours  | Rank, rate and select task to be used<br>- needed, achievable, good vehicle? | Team        | 17-22  |
| ↓   |          |                                                                              |             |        |
| 14  | 4 hours  | Define problem<br>- prepare problem definition sheets                        | Team        | 35-36  |

The estimated total duration for selecting and defining the problem is six hours. At the start of step 13, review the brainstorm output and add any ideas thought of since. The problem should be selected with consideration to the following questions.

- ★ Do we need to do this?
- ★ Is it a good vehicle to use for practising TQ tools and techniques?
- ★ Is it achievable in a reasonable timescale?

When defining the problem, the facilitator could aid the team by structuring the discussions by asking what the problem is and what the problem isn't, or where do we want to move **from** (i.e. current situation) **to** (i.e. ideal situation).' Allow a week for thought on the selected problem before starting the next stage.

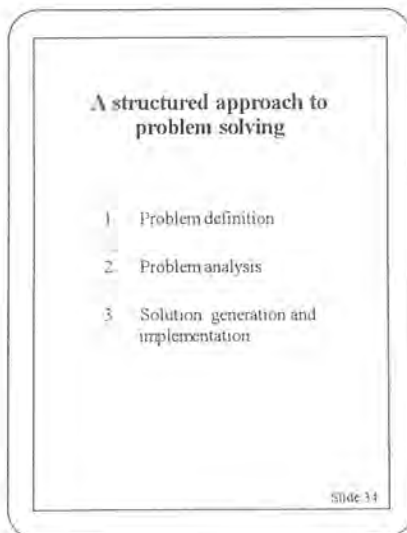
The facilitator should seek feedback and observations at the end of each meeting, and occasionally ask the team if the Team Charter needs any modification. Each meeting must have a timed agenda which is circulated to all those attending at least two days in advance.

### Slide 33 - Traditional approach

The slide suggests that in general our approach to problem solving is unstructured and that we often have a 'pet' solution that we are waiting to apply. When someone suggests that there is a problem in our workplace, this pet solution is often tried and an attempt made to fit it to the problem.



### Slide 34 - Structured approach



Total Quality techniques insist on a recognised and accepted structure to work processes, so that all who work for the organisation understand what they are doing, and why they are doing it. Problem solving is no different, and an accepted, structured approach is necessary. Most TQ organisations use the following stages (although there terminology for the stages may differ).

- ★ Problem definition
- ★ Problem analysis and root cause investigation
- ★ Solution generation and implementation



Slide 35 - Definition of project

The first stage in any problem solving process is to determine exactly what the problem is and how big it is. For example there is little point, and certainly no profit, in putting 100 man-hours of an improvement team's time in making the equivalent of 1 man-hour / year savings.

A form of project proposal is suggested to enable the problem to be defined and quantified, including

- ★ **Problem statement** - define exactly what the effects are.
- ★ **Objective statement** - quantify what improvements are expected when the problem is 'solved'.
- ★ **Means of measurement** - state how you will measure progress towards your objective.
- ★ **Project planning** - what targets and / or milestones do you need to establish, and how will they be phased?
- ★ **Team selection** - have you got the right people in the team to solve your problem?

Stage one - problem definition

- ★ Problem statement
- ★ Objectives statement
- ★ Means of measurement
- ★ Targets / milestones
- ★ Project planning
- ★ Team selection

Slide 35

Slide 36 - What, when, why, etc.

Problem definition questions

|                                                                |                                                       |                                                                 |
|----------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------|
| What?<br>What is the problem?                                  | What isn't the problem?                               | What's distinctive about the problem?                           |
| Where?<br>Where is the problem?                                | Where isn't the problem?                              | What's distinctive about the place?                             |
| When?<br>When did the problem occur?                           | When did the problem not occur?                       | What's distinctive about the period?                            |
| Whom?<br>To whom/what is the problem attached?                 | Whom/what doesn't have the problem?                   | What's distinctive about the person or object with the problem? |
| How often?<br>How often do the problems occur?                 | How often doesn't the problem occur?                  | What's distinctive about the frequency?                         |
| How big?<br>How large and at what rate is the problem growing? | How large and at what rate isn't the problem growing? | What's distinctive about the size or rate of growth?            |

Slide 36

In preparing your project definition it may be helpful to pose these questions, and their opposites, to define distinctive points about the problem and to quantify the effects. This will help you to decide whether a problem is worth solving.

## Develop a problem solving plan

| No. | Duration  | Step                                                                  | Responsible | Slides |
|-----|-----------|-----------------------------------------------------------------------|-------------|--------|
| 15  | 0,5 hours | Introduce cause and effect analysis.                                  | Facilitator | 37-41  |
| ↓   |           |                                                                       |             |        |
| 16  | 1,5 hours | Use cause and effect analysis to establish root causes of the problem | Team        | 37-41  |
| ↓   |           |                                                                       |             |        |
| 17  | 1 hour    | Introduce flow charting                                               | Facilitator | 42-49  |
| ↓   |           |                                                                       |             |        |
| 18  | 2 hours   | Produce plan (include steps such as gather data, develop solutions)   | Team        | 42-49  |

The estimated total duration of the developing the problem stage is five hours. After step 18 the team, leader and facilitator should review progress to date with respect to the Team Charter, any observations, and the process used. The ECI would welcome a report on your experiences.

The following stage is to implement the plan and solve the problem. The team should now know what TQ is, and be comfortable using the tools and techniques introduced. The ECI workbook *Grow your own Quality Improvement Team* covers all these 18 steps in detail, and continues with implementing the plan, checking it works and the future, should the team want further advice.

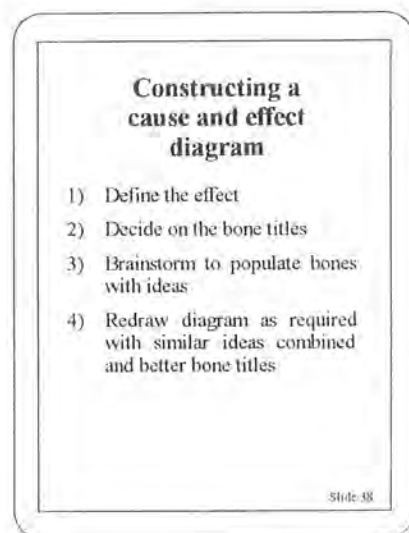
## Slide 37 - What is cause and effect analysis?

Cause and effect analysis is very useful for investigating root causes of problems. It is only when you have found the root cause of a problem that any solution subsequently applied will have a chance of lasting success in eradicating the problem. This is the difference between treating the symptoms of an illness, or tackling the underlying disease.

Cause and effect analysis (using fishbone or Ishikawa diagrams) is a form of structured brainstorming, where we wish to generate all the possible causes of an observed 'effect'. Brainstorming rules apply (slide 14)



## Slide 38 - Fishbone diagram

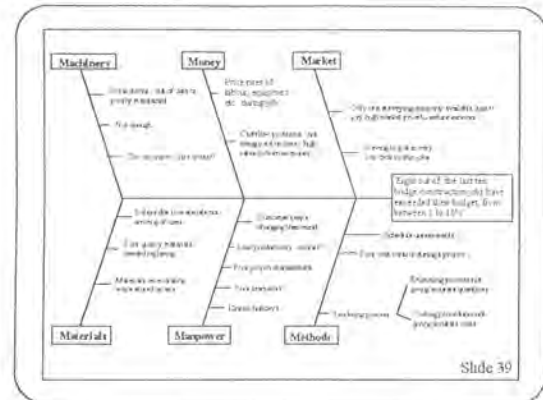


Prior to constructing the diagram, the group should take care to define the problem or effect to be investigated, together with major categories that the causes may fall under.

The diagram is constructed as shown in the next two slides, with usually between three and six 'bones'. The six 'Ms' - manpower, machinery, method, money, market and materials are often used as bone headings.

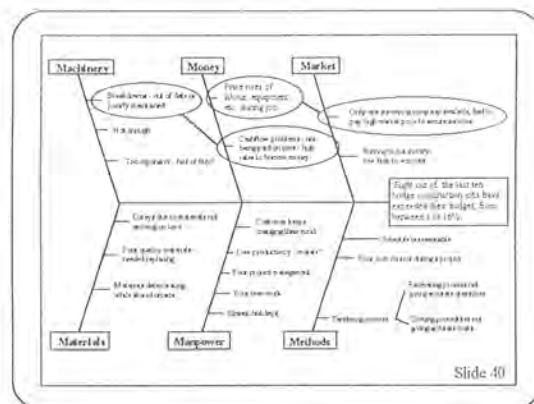
### Slide 39 - Generating causes

Team members generate causes, as in conventional brainstorming, which are grouped under each bone. It is possible that some causes may be considered to be a feature of two bones, e.g., both people and methods. If so, include under both bones.



## Slide 40 - Using the output

Start to look at grouping common ideas and prioritising causes against the effect. This is the first stage in identifying the root cause or causes. Having established the most likely causes, further investigation, in terms of measurement in some form, will be necessary to confirm your views (or otherwise).



## Slide 41 - Tips for cause and effect analysis

Consider these when constructing the diagram

### Tips for cause and effect analysis

- ★ Use brainstorming rules
- ★ Start with a large diagram
- ★ Redraw and change bones as needed
- ★ Keep diagram neat
- ★ Keep an open mind, don't look for solutions yet
- ★ Don't stop too soon, good ideas take hard thinking
- ★ Avoid abbreviations or notes, the diagram should be understandable to someone not present at the session

## Slides 42 and 43 - What is process flowcharting?

Simple definitions of a process and how process steps are joined in a flowchart.

**Process flowcharting**

A process is anything which converts an input into an output by doing work.

Processes include:

- ★ Tender submission
- ★ Goods ordering
- ★ Design
- ★ Project planning

Slide 42

**Process flowcharting**

A process flowchart is a diagram of the steps, in sequential order, that form an overall process

```
graph TD; Step1[Step 1] -- Action --> Step2[Step 2];
```

Slide 43

## Slide 44 - Why use it ?

**Process flowcharting**

Use to help:

- ★ Understand the complete process and show how steps relate
- ★ Streamline the process by eliminating redundant steps and non-productive loops
- ★ Clarify responsibilities
- ★ Show what the inputs and outputs of each step are
- ★ Identify bottlenecks and weaknesses in the process

Slide 44

To provide substantial help to any improvement programme. The flowchart helps to picture a process, which may immediately show obvious improvements - overlaps, duplication and iterative loops are easily identified.

**Slide 45 - When and how to use it**

As is usual with most TQ techniques, the start and end points of a process must be clearly defined. It is often the case that the process being investigated is part of a larger overall activity, and therefore requires a clear statement of what are the initial inputs and final outputs.

When listing the steps, the opportunity should be taken to talk to all individuals involved in the process. The flowchart should be a picture of what really happens and not what might be listed in the procedure manual!

**Process flowcharting**

**When to use?**

- ★ All the time – a necessary part of understanding how any job or process operates.

**How to use it:**

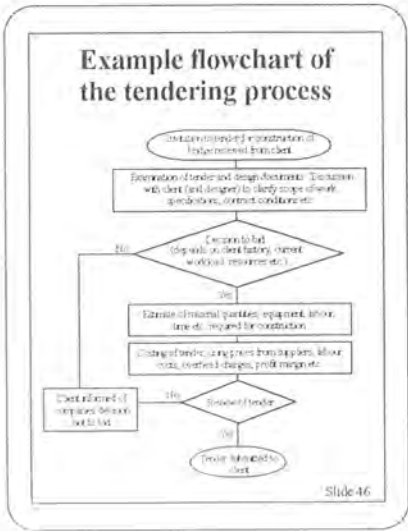
- ★ Define the process
- ★ List the steps involved
- ★ Identify responsibilities and subsidiary steps
- ★ Draw the diagram
- ★ Analyse the flowchart

Slide 45

**Slide 46 - Example flowchart of the tendering process**

This slide illustrates a common process in construction.

In addition to the standard step boxes, note the rounded boxes at the start and end points of the process, and the diamond shaped decision boxes.



# Slides 47 and 48 - Analysing the steps

First look at all the steps in the chart and see how they inter-relate - look for gaps, delays, simplifications. Then look at each step and ask the questions in the boxes.

Analysing the flowchart

Address the following questions:

- ★ What is the reason for each step?
- ★ Are they all needed?
- ★ Are additional steps needed?
- ★ What are the key steps?
- ★ Can any steps be combined?

Slide 47

Analysing each step in a flowchart

```
graph LR; Supplier -- Inputs --> ProcessStep[Process step]; ProcessStep -- Outputs --> Customer; Information --> ProcessStep; Equipment --> ProcessStep; Facilities --> ProcessStep
```

- ★ Who is responsible?
- ★ What are the inputs and outputs?
- ★ Who are the customers and suppliers?
- ★ What does the customer really want?
- ★ What is measured and how?
- ★ Is the step fully understood?
- ★ What information / equipment / facilities are required, how could these be improved?

Slide 48

## Slide 49 - Tips for process flowcharting

Three tips to remember.

Tips for process flowcharting

- ★ Keep the diagram simple
- ★ Use facts not opinions, discover what actually happens (not what should), and ask customers their requirements, don't guess
- ★ Involve those people who operate the process

Slide 49





## **Appendix G.     Slides**

The 49 slides in this appendix are to support the structured programme of chapter four.

They are produced full size so the reader may easily reproduce them. The publishers Thomas Telfords have specially agreed to allow free copying of this appendix only (see page facing contents listing).

## Definition of a facilitator

Someone who can enable the organisation to develop the TQ process. This is achieved;

- i) by equipping individuals with TQ skills, including TQ tools and techniques, and
- ii) by demonstrating ways in which these can be applied or adapted to make improvements,

both in their own activities and in combination with others.

## **What is the role of a facilitator?**

1. To support and enable the team.
2. Not to be just a trainer
3. Not to be responsible for all improvement activity.
4. To act as a consultant
5. Not to answer everybody's quality problems or to 'do TQ' for everyone else.
6. To strive to create a 'TQ' climate.

## **Facilitation of teams**

1. Application of TQ tools and techniques.
2. Knowledge of process vs task and team dynamics.
3. Ability to observe and feedback constructively.
4. Adapt to leaders requirements.

## **The leader's responsibilities**

1. Management of the team.
2. Applying TQ principles to problem solving.
3. Ensuring the team achieves the objectives of the project.
4. Overall demonstration of commitment to the TQ process.
5. Identifying and building on team member skills.

## Management style

1. Coaching and mentoring.
2. Encouraging team co-operation - ensuring good communication, supported by personal example.
3. Ensuring all team members are aware of their roles and responsibilities, and recognising such involvement and achievement.
4. Emphasis on clear standards and measures.

## **Customer focus**

1. Recognition of customer and supplier chains, internal and external.
2. Ensuring all team members are aware of their roles in this respect and the responsibilities in meeting requirements.

## **The leader and facilitator contract**

1. Recognition of complementary roles: facilitator to observe, intervene and train, leader to manage, motivate and ensure objectives are met.
2. Prior agreement of each others responsibilities and duties
3. Allocation of regular tasks



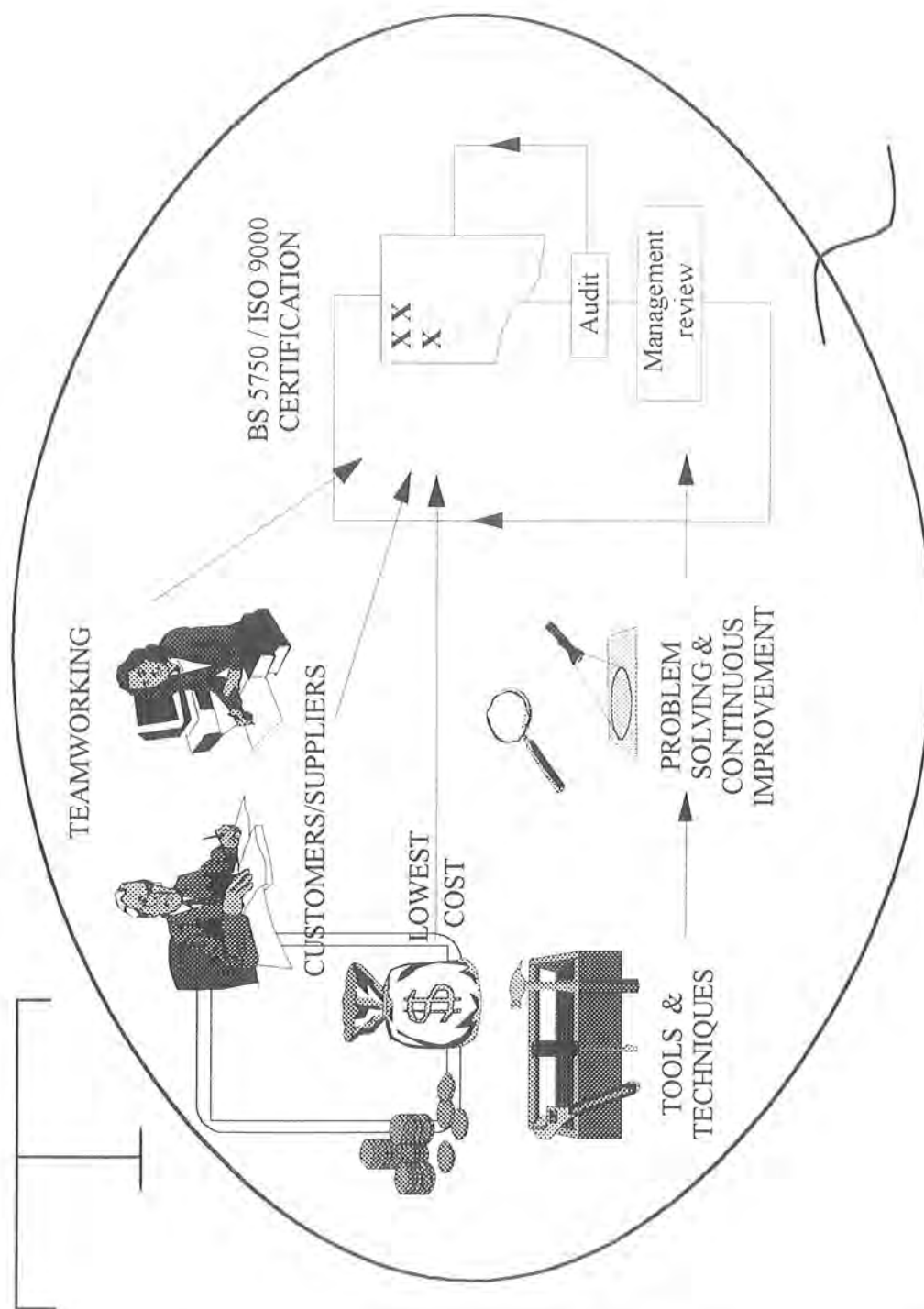
## The leadership aspects of management

|                                                                                               |                                                                                              |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <p>The Head<br/>Organisational<br/>leadership</p> <p>Role</p> <p>'Doing the right things'</p> | <p>The Heart<br/>Inspirational<br/>leadership</p> <p>Vision</p> <p>'Inspiring the doing'</p> |
| <p>The Feet<br/>Daily<br/>management</p> <p>Administration</p> <p>'Getting things done'</p>   | <p>The Hands<br/>Operational<br/>leadership</p> <p>Style</p> <p>'Doing things right'</p>     |

## What is Total Quality?

It is 'continuously meeting customer requirements at lowest cost, by releasing the potential of all employees' - that means;

- ★ the customer sets the standards
- ★ reducing costs by persistently eliminating errors
- ★ continuously improving the performance of all activities
- ★ utilising the creativity and skills of every employee
- ★ only doing what is required to meet customer needs, and adds value, not cost



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### Total quality is:

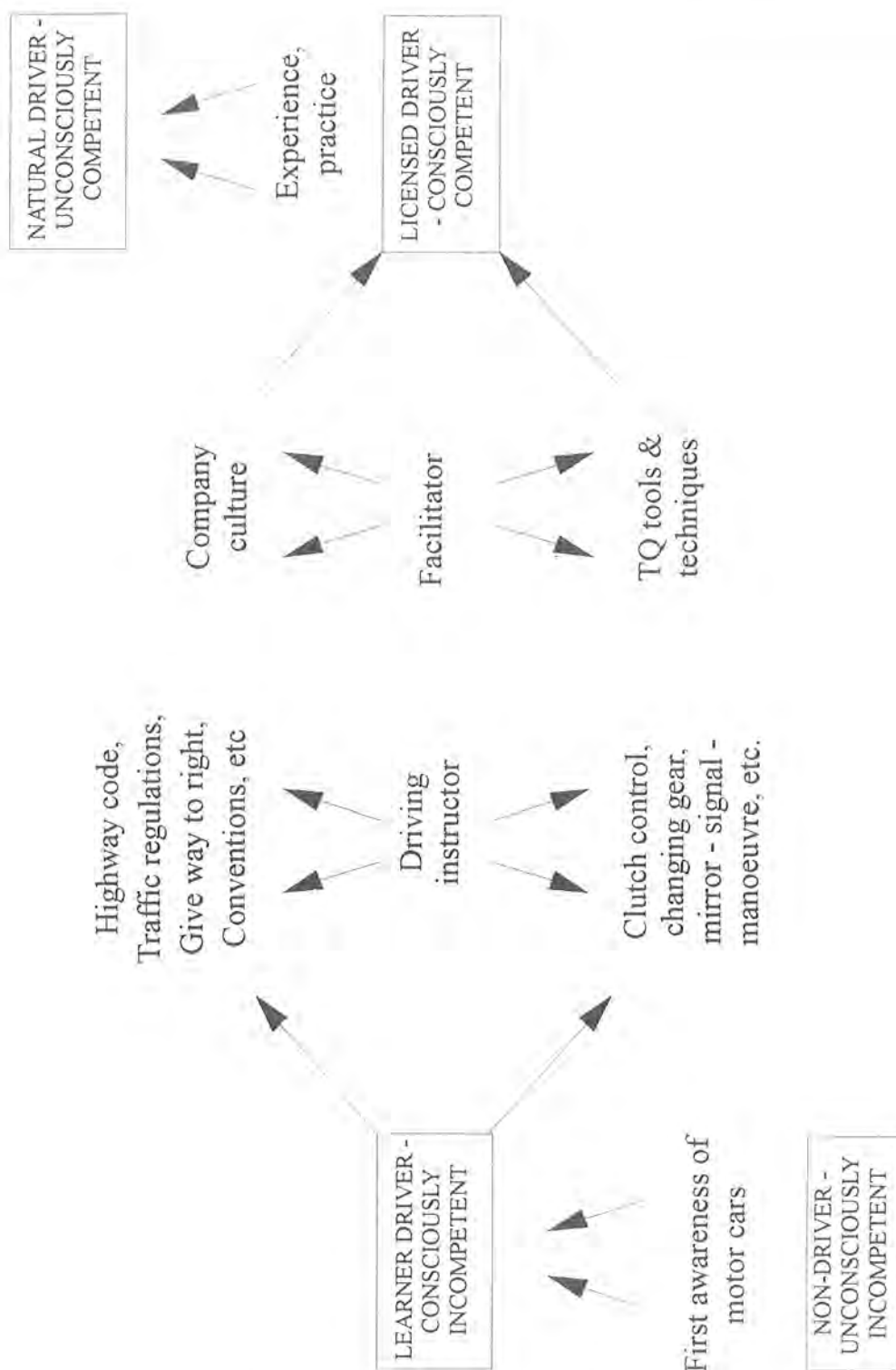
- ✓ Common sense
- ✓ Getting the best out of people
- ✓ Working together
- ✓ Planned common goals
- ✓ Communication
- ✓ Leadership by example
- ✓ For everyone
- ✓ Customer focus
- ✓ Attitudes
- ✓ Measuring progress

### Total quality is not:

- ✗ Doing the cheapest job possible
- ✗ Working harder
- ✗ Legislation
- ✗ A luxury
- ✗ Complicated (though it is hard work)
- ✗ Paperwork
- ✗ Yet another management initiative
- ✗ A one off activity, it should be part of normal business

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# Brainstorming

Used to:

- ★ Generate a list of problems
- ★ Identify possible causes
- ★ Identify possible solutions
- ★ Develop action plans

Good for:

- ★ Complex problems
- ★ Involving those affected
- ★ Lateral thought

## Brainstorming rules

- ★ No discussion of ideas
- ★ Everyone to contribute
- ★ Problem definition displayed
- ★ Lots of ideas
- ★ Positive encouraging atmosphere
- ★ Allow time for thought
- ★ Accept every idea, no matter how crazy

## **The leader's role in brainstorming**

To ensure

- ★ Everyone understands the problem clearly
- ★ Not everyone talks at once
- ★ Rules and times are kept to
- ★ The energy of the session is maintained
- ★ Ideas are coaxed from everyone present
- ★ All ideas are recorded, and without alteration or abbreviation



## Using the output of a brainstorm

- ★ Allow a few days for reflection and new ideas to generate
- ★ Remove any clearly ridiculous ideas
- ★ Classify ideas into groups
- ★ Expand and revisit any groups lacking ideas
- ★ Order the ideas by referring back to the problem - use ranking and rating tools

## **What is ranking and rating?**

A structured process for sorting ideas or options into an ordered list according to a number of chosen criteria.

Usually a two part process where ideas or options are given scores for each of the criteria (rating), then listed from highest to lowest final scores (ranking).

## Why use ranking and rating?

- ★ Extremely flexible tool
- ★ A simple structured way of making difficult decisions
- ★ Multiplying the scores together differentiates between the closest options
- ★ Allows all involved to "have a say", increasing their ownership of the decisions made through consensus
- ★ Focuses the group on decisions and away from circular decisions

## Ranking and rating criteria

The number of criteria should be sufficient to differentiate between options and no more. As a guide for between 5 and 50 ideas, two criteria will be adequate. Commonly used pairs of criteria include:

- ★ Effect and influence
- ★ Consequence and probability
- ★ Essential and desirable properties

## Effect and influence criteria for ranking and rating

Goal: To reduce time taken to prepare bids

| Option                       | Effect | Influence | Total | Rank |
|------------------------------|--------|-----------|-------|------|
| Increase No. people involved | 6      | 5         | 30    | 3    |
| Increase / pay overtime      | 5      | 4         | 20    | 5    |
| Reduce No. of bids sent out  | 8      | 4         | 32    | 2    |
| Reduce information in bids   | 8      | 3         | 24    | 4    |
| Increase productivity        | 8      | 7         | 56    | 1    |
| Eliminate delays             | 4      | 3         | 12    | 6    |

## Essential properties method of ranking and rating ideas

| Property                 | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 |
|--------------------------|--------|--------|--------|--------|--------|
| Planning permission      | ✓      | ✓      | ✓      | ✓      | ✗      |
| Sufficient area          | ✓      | ✓      | ✓      | ✓      | ✓      |
| Near major road          | ✓      | ✓      | ✓      | ✓      | ✓      |
| Available local labour   | ✓      | ✓      | ✓      | ✓      | ✓      |
| Stable ground conditions | ✓      | ✗      | ✓      | ✓      | ✓      |
| Outcome                  | ✓      | ✗      | ✓      | ✓      | ✗      |

## Desirable properties method of ranking and rating ideas

| Property                                     | Weighting | Site 1 | Site 3 | Site 4 |
|----------------------------------------------|-----------|--------|--------|--------|
| Area tax concessions / grants available      | 5         | 5      | 5      | 0      |
| Supplies and raw materials available locally | 8         | 6      | 5      | 5      |
| Existing water, gas and electricity supplies | 6         | 2      | 4      | 6      |
| Near large customers                         | 4         | 3      | 2      | 0      |
| Existing road to site                        | 2         | 2      | 0      | 2      |
|                                              | Total     | 18     | 16     | 13     |

## Key skills brainstorm

What skills do you believe improve the following:

- ★ Teamwork
- ★ Leadership
- ★ Communication



## **Developing a team charter**

Ten to twelve statements of team behaviour.

- 1) Brainstorm teamwork, leadership and communication
- 2) Classify / group brainstorm output
- 3) Rank and rate - identify top 3 from each topic
- 4) Develop team charter from output of previous step

## What is a team?

A small number of people:

- ★ with complementary skills who are committed to:
- ★ a common purpose, a set of performance goals and an approach for which they hold themselves mutually accountable.

## **Teams should include**

- \* Those with required skills
- \* Those affected by the problem
- \* Those involved in any solutions
- \* A leader, and facilitator, chartist and observer as required

## Helpful team behaviours

- ★ Objective setting
- ★ Encouraging involvement and contributions
- ★ Being positive and looking for common ground
- ★ Active listening
- ★ Maintaining focus on the objective or task
- ★ Summarising progress and looking for consensus - win/win positions

## Unhelpful team behaviours

- ★ Dominance by individuals
- ★ Ignoring or interrupting contributions from others
- ★ Wandering discussions without focus
- ★ Destructive criticism, provocation of others

## Tips on giving feedback

- ★ Focus feedback on specific descriptions of behaviour in the context of the group discussion.
- ★ Consider the needs of the person receiving feedback, not your own needs.
- ★ Limit feedback to behaviours the receiver is capable of modifying.
- ★ Check for understanding to make sure the message is clear.
- ★ Focus feedback on sharing information rather than 'imposing advice'.

## **The chartist's role in a team**

To record the teams views

- ★ quickly
- ★ accurately
- ★ legibly

without

- ★ interpretation
- ★ abbreviation

## Belbin roles

- ★ Team worker
- ★ Plant (creative thinker, not always practical)
- ★ Resource investigator
- ★ Co-ordinator
- ★ Monitor evaluator
- ★ Implementor
- ★ Specialist
- ★ Completer finisher
- ★ Shaper (decisive, sometimes without sufficient facts)



## Team phases

- ★ Forming
- ★ Storming
- ★ Norming
- ★ Performing

# **The traditional approach to problem solving**

**On your marks!**

**Go!**

**Get set!**

## **A structured approach to problem solving**

- 1) Problem definition
- 2) Problem analysis
- 3) Solution generation and  
implementation

## Stage one - problem definition

- ★ Problem statement
- ★ Objectives statement
- ★ Means of measurement
- ★ Targets / milestones
- ★ Project planning
- ★ Team selection

## Problem definition questions

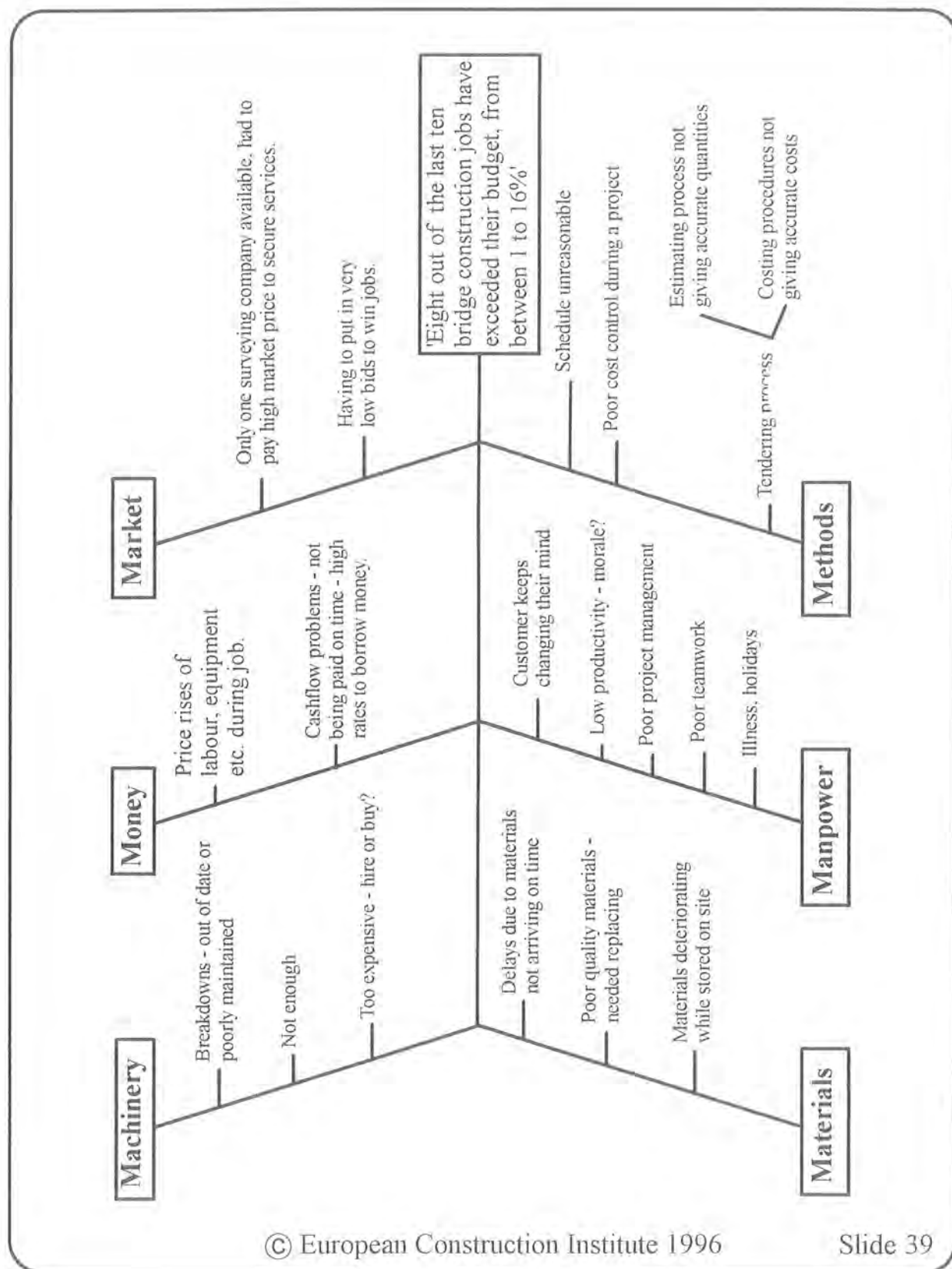
|                                                                       |                                                       |                                                                 |
|-----------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------|
| <b>What?</b><br>What is the problem?                                  | What isn't the problem?                               | What's distinctive about the problem?                           |
| <b>Where?</b><br>Where is the problem?                                | Where isn't the problem?                              | What's distinctive about the place?                             |
| <b>When?</b><br>When did the problem occur?                           | When did the problem not occur?                       | What's distinctive about the period?                            |
| <b>Whom?</b><br>To whom/what is the problem attached?                 | Whom/what doesn't have the problem?                   | What's distinctive about the person or object with the problem? |
| <b>How often?</b><br>How often do the problems occur?                 | How often doesn't the problem occur?                  | What's distinctive about the frequency?                         |
| <b>How big?</b><br>How large and at what rate is the problem growing? | How large and at what rate isn't the problem growing? | What's distinctive about the size or rate of growth?            |

## What is cause and effect analysis?

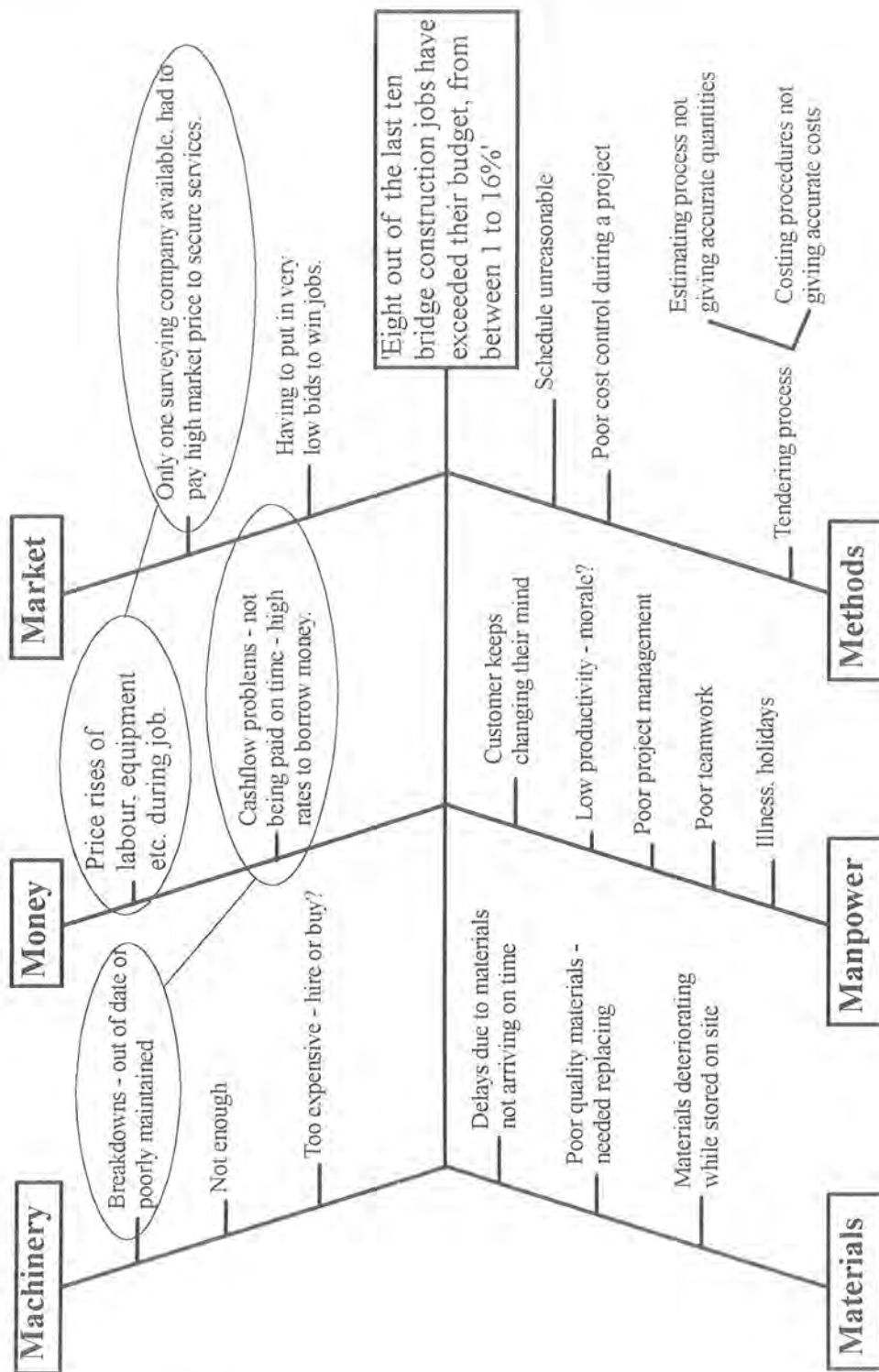
- ★ Structured brainstorming
- ★ Breaks complex problems down
- ★ Sorts and records ideas
- ★ Gives focus to generate more ideas
- ★ All areas considered
- ★ Points to root causes

## **Constructing a cause and effect diagram**

- 1) Define the effect
- 2) Decide on the bone titles
- 3) Brainstorm to populate bones with ideas
- 4) Redraw diagram as required with similar ideas combined and better bone titles







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## Tips for cause and effect analysis

- \* Use brainstorming rules
- \* Start with a large diagram
- \* Redraw and change bones as needed
- \* Keep diagram neat
- \* Keep an open mind, don't look for solutions yet
- \* Don't stop too soon, good ideas take hard thinking
- \* Avoid abbreviations or notes. The diagram should be understandable to someone not present at the session

# Process flowcharting

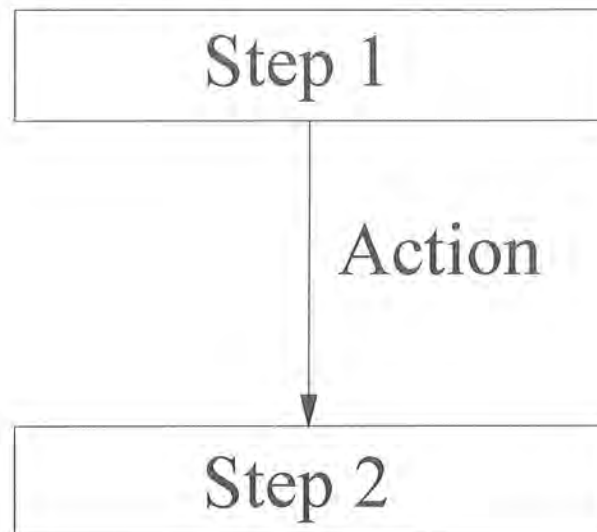
A process is anything which converts an input into an output by doing work.

Processes include:

- ★ Tender submission
- ★ Goods ordering
- ★ Design
- ★ Project planning

## Process flowcharting

A process flowchart is a diagram of the steps, in sequential order, that form an overall process.



# Process flowcharting

Use to help:

- ★ Understand the complete process and show how steps relate
- ★ Streamline the process by eliminating redundant steps and non-productive loops
- ★ Clarify responsibilities
- ★ Show what the inputs and outputs of each step are
- ★ Identify bottlenecks and weaknesses in the process

# Process flowcharting

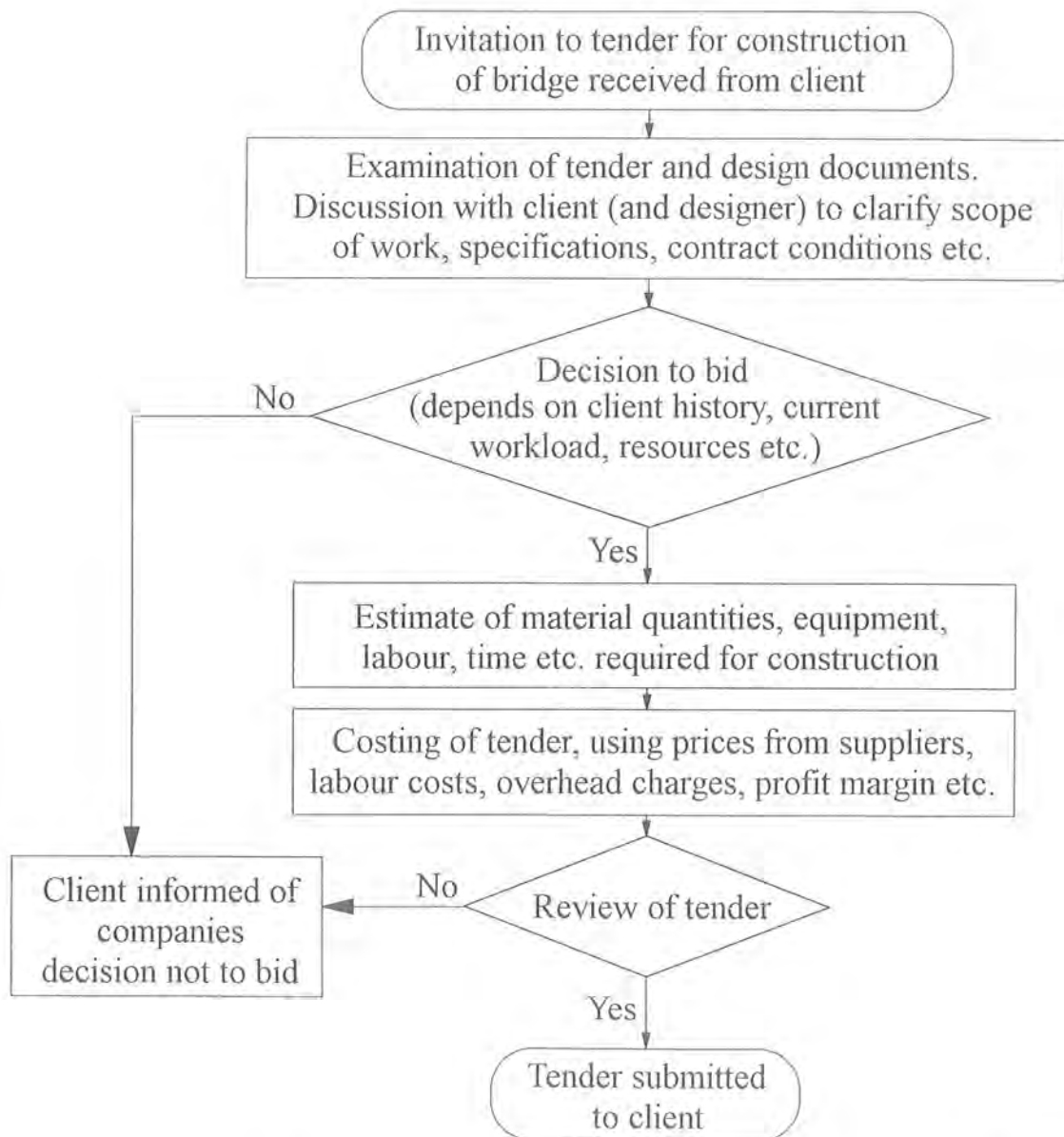
## When to use?

- ★ All the time as necessary part of understanding how any job or process operates

## How to use it

- ★ Define the process
- ★ List the steps involved
- ★ Identify responsibilities and subsidiary steps
- ★ Draw the diagram
- ★ Analyse the flowchart

## Example flowchart of the tendering process



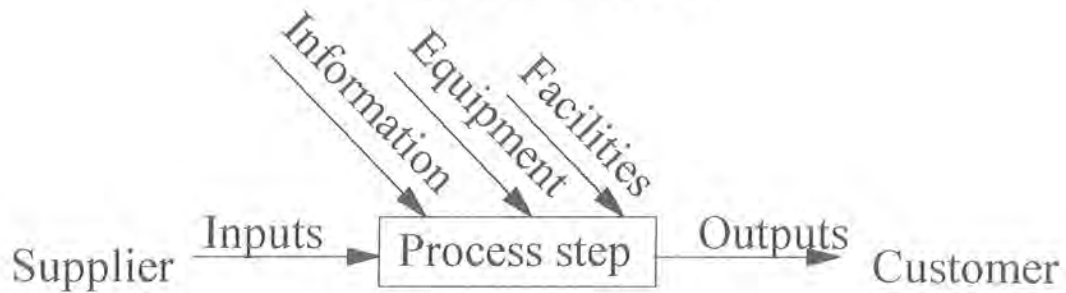
## Analysing the flowchart

Address the following questions

- ★ What is the reason for each step?
- ★ Are they all needed?
- ★ Are additional steps needed?
- ★ What are the key steps?
- ★ Can any steps be combined?



## Analysing each step in a flowchart



- \* Who is responsible?
- \* What are the inputs and outputs?
- \* Who are the customers and suppliers?
- \* What does the customer really want?
- \* What is measured and how?
- \* Is the step fully understood?
- \* What information / equipment / facilities are required, how could these be improved?

## Tips for process flowcharting

- ★ Keep the diagram simple
- ★ Use facts not opinions, discover what actually happens (not what should), and ask customers their requirements, don't guess
- ★ Involve those people who operate the process

## **Appendix H. Case study**

This appendix details of the experiences of a small team who used the structured programme of chapter four as a basis for tackling a problem in their department. The members knew each other from the department before the programme, but did not usually all work together.

The selected task was completed over three months, without disruption to business as usual, and an excellent result was achieved. Using the team charter approach, the team's knowledge of effective teamworking dramatically improved, as did their ability to use some of the TQ tools and techniques.

## Programme milestones and deliverables

- 1) The team leader identified a facilitator and seven team members to participate in the programme. The team leader contacted all to discuss their involvement.
- 2) The team leader and facilitator discussed their roles and agreed a contract (*attachment 1*).
- 3) The team leader and facilitator planned the first team meeting and developed the agenda. The team leader wrote to all team members, inviting them to the meeting and enclosing an agenda. (*attachments 2 and 3*).
- 4) Results (deliverables) from the first team meeting included the following:
  - ★ Brainstorm of what TQ is *attachment 4*
  - ★ Result of brainstorming, ranking and rating
    - Leadership *attachment 5*
    - Team working *attachment 6*
    - Communication *attachment 7*
  - ★ Team Charter developed from attachments 5, 6 and 7 *attachment 8*
  - ★ Results of brainstorming potential tasks *attachment 9*
  - ★ Team observations *attachment 10*
- 5) The team leader and facilitator reviewed the outcome of the first team meeting versus their contract and the planned agenda. They then planned the second team meeting, including the selection of a task, and developed the agenda. The team leader wrote to all team members inviting them to the meeting, enclosing the agenda and the proposed task (*attachments 11, 12 and 13*). Copies of the results (deliverables) from the first meeting were also attached.
- 6) Results (deliverables) from the second team meeting included the following
  - ★ Results of the brainstorm using post-its. Each member wrote their ideas on a post-it and stuck it onto a board. The post-its were then grouped together under classified headings. *attachment 14*
  - ★ Proposal for holding a workshop with all 25 members of the unit affected by the proposed task. The team leader subsequently wrote to all members inviting them to the workshop and enclosing an agenda. *attachments 15 & 16*
  - ★ Team volunteers appointed to project manage.

- 7) The workshop was held on 10 April and involved all members of the team. The team leader worked with the project team to develop the task. The observations (*attachment 17*) and results of the workshop were issued to all attendees (*attachments 18 (a), (b) and (c)*).
- 8) The team leader and facilitator met to consider progress on the teamwork programme and what remained to be done to ensure that the desirable range of TQ tools and techniques had been introduced and tried. Based on these deliberations, the team leader wrote to all team members inviting them to a third meeting and enclosing the agenda (*attachments 19 and 20*).
- 9) Deliverables from the third team meeting included the following:
  - ★ Problem definition form *attachment 21*
  - ★ Key issues selected from reviewing the problem statement and classifying the results *attachment 22*
  - ★ Fishbone diagram of the key issues *attachment 23*
  - ★ Flowchart to represent the steps in the project to improve the information retrieval system *attachment 24*
  - ★ Initial results from document reduction exercise *attachment 25*
  - ★ Summary of the process of achieving the task plan *attachment 26*
  - ★ Final observations and conclusions by the team *attachment 27*

**Team leader and facilitator contract**

To jointly plan the structure and facilitating roles to be used at the meeting

- ★ Objectives for the meeting to be clearly stated
- ★ Team charter to be in view

Facilitator to have the option of participating in the meeting as a contributor of relevant information

Interventions appropriate for the facilitator to make as a facilitator to include

- ★ significant deviations from the team charter which are having a negative effect
- ★ facilitator to use their judgement whether to bring to the attention of the whole team or quietly to inform the team leader
- ★ where the facilitator considers the use of a particular TQ tool or technique would help the team to progress
- ★ when requested by the team leader or the team

Team leader to ensure that the team charter is followed and to steer the group appropriately if difficulties arise, seeking advice from the facilitator and the team. Time keeping, relevance, etc. to be controlled as necessary

Develop methods to obtain and record observations from the team and the facilitator, such as

- ★ what went well
- ★ what difficulties had to be overcome
- ★ individual feelings
- ★ helpful hints, dos and don'ts for the team leader and facilitator

## **Invitation to meeting 9 March**

### **Team working initiative**

I have briefly spoken to all of you about helping me with this initiative during the next three months. I am confirming the invitation to attend the kick-off meeting on Wednesday, 15 March at 0900 hrs in Room 827. Lunch has been organised for 1230 hrs and the meeting will close following lunch.

As part of Construction's TQ initiative we have been working with the European Construction Institute to improve our understanding of team working and to experiment and develop experience of the problems that teams face in making progress in this area. The work that we do together will focus on real work related problems which we will plan to resolve as a way of learning more about working together in teams.

You do not need to do any preparation for this initiative, just come forward with a will to participate and learn with all of us. I look forward to seeing you on the 15 March.

**Construction commercial unit: case study  
first meeting 15th March - Room 827**

**Agenda**

|      |                                                                                 |             |
|------|---------------------------------------------------------------------------------|-------------|
| 0900 |                                                                                 | Led by      |
| 1)   | Briefing on the project                                                         | Team leader |
| 2)   | Introduction to TQ presentation                                                 | Facilitator |
| 3)   | Brainstorming, ranking and rating presentation                                  | Facilitator |
| 4)   | Exercise to identify key elements of leadership, team working and communication | Team leader |
| 5)   | Ranking and rating                                                              | Team leader |
| 6)   | Agreement of team charter                                                       | Team leader |
| 7)   | Discuss role of observer                                                        | Facilitator |
| 8)   | Brainstorm potential tasks                                                      | Team leader |
| 9)   | Analysis and observations session                                               | Facilitator |



## Attachment 4

### TQ is

- ★ Common sense
- ★ Best solution
- ★ Effective discipline
- ★ Defining the requirements
- ★ Right first time
- ★ Getting the best out of people and systems
- ★ Identify customers and customer needs
- ★ Good results
- ★ Working together to reach a common goal
- ★ Communication
- ★ Co-operation

Initial team brainstorm 15 March

## Attachment 5

### Ranking and rating the key aspects of leadership, teamworking and communication

#### Leadership

1. A leader should be **approachable**
2. A leader should be **open minded**
3. A leader should **set clear objectives**
4. A leader should **coach, guide, delegate** and **empower**

**Ranking and rating the key aspects of leadership,  
teamworking and communication**

**Teamworking**

1. **Listening and supporting**, giving constructive feedback
2. **Clear objectives** with a consensus on 'why', and success criteria and measures
3. **Honesty and openness**, with good humour and no hidden agendas
4. **Identify, develop and use team strengths** through being prepared to train and help each other, participate and learn by doing

**Ranking and rating the key aspects of leadership,  
teamworking and communication**

**Communication**

1. **Clear and concise**, being objective, relevant and timely, in plain English
2. **Use appropriate TQ tools**, and test a variety of approaches to stimulate interest. Preplanning is a key to effective communication, i.e. engage brain before opening mouth!
3. **Feedback**, through listening, appropriate planned meetings and supportive body language in face to face situations. Ensure two way communication and test comprehension
4. **Operate a no blame culture** to ensure people are prepared to be open in their communications, with a willingness to learn from opportunities and mistakes

## Team charter

As a team and individually we will

### What

Set clear objectives

Identify and use team strengths

Manage time effectively

Operate honestly and openly

Listen and support one another

Use a facilitating approach

Communicate clearly and concisely

Give supportive feedback

### How

Brainstorm, rank and rate, ask why five times, set success criteria and measures

Cross training, experiment, encourage and support participation

Prioritise, share work, appoint a timekeeper

No hidden agendas, share ideas and information, welcome new ideas, be approachable

Supportive body language, facial expressions, co-operate, help and encourage

Coaching, empowering, using appropriate TQ tools, using a facilitator and observer

Be objective, relevant, timely, face to face, two way, interesting, use plain English and avoid jargon. Think before speaking, pre-plan major communication

No blame culture, constructive criticism, regular analysis by team versus team charter based on observations, test comprehension

**Potential tasks**

- 1) Investigate the use of electronic mail (e-mail) in construction, identify issues and plan improvements
- 2) Develop a management strategy for handling transitional workload in pending construction re-organisation
- 3) Investigate why the department safety fishbone diagram for recording problems and suggestions is not being used
- 4) Investigate why we have so many IT problems with other departments
- 5) Develop a plan to reduce waste
- 6) Develop communication standards for an improvement initiative
- 7) Follow up on the recent document classification and IT security audit
- 8) Improve the telephone response and answering service of the department
- 9) Review and improve the filing system

**Commercial unit team work**  
**15th March - Team observations**

**What went well?**

- ★ We completed the task
- ★ We maintained good discipline
- ★ The group worked harmoniously
- ★ There was a good understanding of brainstorming

**Was the order logical?**

- ★ The pace of the brainstorming was too quick and we jumped rapidly from one subject to another. We needed to spend more time classifying the lists prior to ranking and rating.

**Did the early part logically set up what was to follow?**

- ★ The team found no hidden agendas and based on previous experience of working together the atmosphere was trusting. On this basis there were no problems with the logic of the presentations.

**What could be improved?**

- ★ Probably the invite letter could have appended more details of the agenda and purpose.
- ★ The brainstorm sessions were run on a one contribution and pass mode, waiting your turn to make additional contributions. The group would like to try a bouncy session next time to see if it sparked more good ideas.

**Letter of invitation 28th March**

**Teamwork meeting 4th April**

I have attached the papers and the agenda for our meeting which is the follow up we agreed at our session on 15th March. The meeting will be held in Room 803 and will be followed by lunch at approximately 1230 hrs. I look forward to seeing you all there and trying to work together with our new team charter.

**Case study 2nd meeting**  
**4th April - room 803**

**Agenda**

- 0930 Feedback from the initial meeting
- ★ Initial 'What is TQ?' brainstorm (attached)
  - ★ Team charter (attached)
  - ★ Observations and feedback (attached)
- 0945 Team Charter, process and allocation of roles
- ★ Time keeper
  - ★ Observer
  - ★ Chartist
- 1000 Coffee
- 1015 Introduce the task (attached)
- ★ Discussion
  - ★ The five whys (post-it exercise)
  - ★ Agreement
- 1115 Plan for meeting on 10 April
- ★ Objectives
  - ★ Outline agenda
  - ★ Allocation of roles
  - ★ Use of library consultancy
- 1230 Lunch

**Teamwork meeting**

**4th April**

**Details of task**

Following our brainstorm on 15th March concerning potential tasks for the group to carry out, I would now like to propose the following for consideration at our meeting on Tuesday, 4th April.

Plan and execute a follow up to the document and IT security audit which would involve the commercial unit and re-organisation team. The plan would be to ensure

- ★ Understanding of the document security classification and what to do with documents
- ★ Understanding of IT security procedures
- ★ Assessment of the need for improved procedures in the above areas
- ★ Identification and elimination of unnecessary and duplicate documents, manuals, etc.
- ★ Archiving or remote storage of infrequently used documents



### Results of five Whys Brainstorm in Proposed Task

#### Comply with policy

- 1) Comply with company policy
- 2) Document security
- 3) Focus on needs
- 4) Towards world's best
- 5) Improves confidentiality
- 6) Good practice
- 7) Comply with ISO 9000
- 8) Re-visit original needs

#### Reduces waste improves efficiency

- 1) Reduce waste
- 2) Improve information access
- 3) Flexibility of desk use
- 4) Reachable data
- 5) Improve personal administration
- 6) Eases move
- 7) Find it first time
- 8) Reduce duplication
- 9) Accessibility

#### Improve environment

- 1) Better working environment
- 2) Learn to live in a smaller space
- 3) Easier to move to new premises
- 4) Easy to clean
- 5) Promotes health and safety
- 6) Aesthetically pleasing
- 7) Reduces fire risk
- 8) More working space

#### Improve morale

- 1) Feel good
- 2) Improve personal administration
- 3) Avoid embarrassment
- 4) Aids team spirit
- 5) Improves construction image

#### Towards new culture

- 1) Practice team leadership and communication skills
- 2) Opportunity to identify team skills

**Invitation to workshop**  
**5th April**

**Document and IT security**

I am writing to advise you of the workshop we have planned in Room 8 on Monday 10 April concerned with document and IT security. The proposed agenda for the workshop is attached and addresses the concerns raised as a consequence of a recent unsatisfactory audit.

The objectives of the workshop are as follows.

- 1) To ensure that the findings of the recent audit are communicated to all.
- 2) To ensure that staff are aware of the company policy and guidelines on document security and IT security and can identify the issues involved in achieving compliance.
- 3) To brief staff on a proposed pilot programme to move towards a clearer desk policy by eliminating duplicate and unnecessary paperwork, and by operating with readily available common manuals, etc. We propose to use the services of an experienced library consultant to help us individually in this pilot programme and a representative will explain their process at the workshop.

I look forward to seeing you at the workshop.

**Document and IT security workshop**  
**10th April - Conference Room 8**

**Agenda**

- |      |                                                                                                                                     |
|------|-------------------------------------------------------------------------------------------------------------------------------------|
| 0930 | Welcome and introduction                                                                                                            |
| 0940 | Report on findings from security audit                                                                                              |
| 1000 | Document security classification                                                                                                    |
| 1030 | IT security                                                                                                                         |
| 1100 | Presentation on moving towards clearer desks<br>through reducing documentation and<br>providing more effective storage and handling |
| 1200 | Next steps - action plan                                                                                                            |
| 1230 | Buffet lunch                                                                                                                        |

**Feedback and observations  
from 2nd meeting on 4th April**

- ★ Two new group members joined the team - need for a short induction process at the start of the meeting.
- ★ 'Bouncy' brainstorm adopted for five whys. Slow starting but in the event a high quantity and quality of ideas were generated
- ★ Method of categorisation of brainstorm output was effective
- ★ Post-its would have aided categorisation process
- ★ Overled by the team leader
- ★ Inadequate opportunities for debate (specifically the reason for doing the pilot program)
- ★ Little involvement from some people
- ★ Good timekeeping, satisfactory involvement
- ★ Feeling that the team achieved a lot in 2.5 hours
- ★ Good analysis of the task
- ★ Need to check for understanding - uncertainty in some minds as to the process by which task was to be chosen
- ★ The team 'did the business'
- ★ In the main the team charter was adhered to

## **Results of the workshop sent to all attendees**

12th April

### **Document and IT security**

On Monday, 10 April a workshop was held to discuss document and IT security. A number of presentations were given and discussions held. The presentations given were on the following,

- ★ Report on the findings from security audit
- ★ Document security classification
- ★ IT security
- ★ On moving towards clearer desks through reducing documentation and providing more effective storage and handling

The following questions, suggestions and ideas resulted through the discussion sessions

### **Document security classification**

- ★ Secure areas concept, for example, tender documents
- ★ Fireproof filing cabinets
- ★ Issue documents only on an absolute need to know or have basis
- ★ Identify confidential classification life span for each document
- ★ Guard against familiarity, breeds contempt
- ★ Regular audits
- ★ Prevent loss, create backup
- ★ Better definition and policy with respect to "commercially sensitive information" which could be targeted
- ★ Secure storage clearly identified
- ★ Provide replacement keys where necessary
- ★ Documentation classification, identify who is responsible. If client document then check with the client as they may consider document classification requirements different

### **IT Security**

- ★ Locking of PCs in hot desk environment, legitimate access to PCs/information to be provided
- ★ Ensure electronic mail access for visitors
- ★ Develop procedure for getting authorisation to use new software
- ★ Seek some advice on virus control with regular virus checkers
- ★ Clearly identify the dos and don'ts of anti-virus behaviour
- ★ Is the 'c' drive a place to keep data or should all data be stored on the network or floppy disks?

**Results of the workshop sent to all attendees**  
**12th April**

**Moving towards clearer desks brainstorm**

**In favour**

- ★ Improves office environment
- ★ Improves security and knowledge sharing
- ★ Introduces more formal document control systems
- ★ Reduces overhead costs
- ★ Eliminates duplication
- ★ Provides company benchmark
- ★ Improves cost awareness
- ★ Reduces costs of moving
- ★ Stimulates review of procedures

**Against**

- ★ Need culture to support
- ★ Prefer scruffy office - personality
- ★ Reduces personal information ownership
- ★ Easy access from a deep pile of documents
- ★ Chaos = creativity
- ★ Potential for duplication
- ★ Additional archive storage and recall charges
- ★ Potential for office space to be cluttered with recalled archive boxes

Consultants are being commissioned to assist us in moving towards clearer desks through reducing documentation and providing more effective storage and handling. This will be conducted as a pilot programme mainly confined to the sixth floor area. A number of groups who are to take part in the programme have been identified and are listed below.

- ★ Administration
- ★ Finance / planning
- ★ Training
- ★ Re-organisation project
- ★ Management offices

The consultants will help each group to develop group retention schedules. This is to begin on Friday, 21 April. Please find the task programme attached for your information.

Clear desk pilot programme

| Task name                                           | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 |
|-----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Clear desk trial                                    |       |       |       |       |       |       |       |
| Retention schedule group meetings Friday 21st April |       |       |       |       |       |       |       |
| Administration group                                |       |       |       |       |       |       |       |
| Commercial managers office                          |       |       |       |       |       |       |       |
| Director's office                                   |       |       |       |       |       |       |       |
| Finance / planning                                  |       |       |       |       |       |       |       |
| Retention schedule group meetings Wed 26th April    |       |       |       |       |       |       |       |
| Training group                                      |       |       |       |       |       |       |       |
| IT manager's office                                 |       |       |       |       |       |       |       |
| Re-organise manager's office                        |       |       |       |       |       |       |       |
| Re-organise project group                           |       |       |       |       |       |       |       |

Following brief discussion between group leaders and the consultants the whole group will participate in developing the retention schedule

Clear desk pilot programme

| Task name                                | Duration | May  |      | June |     |      |      |      |     |      |      |      |     |
|------------------------------------------|----------|------|------|------|-----|------|------|------|-----|------|------|------|-----|
|                                          |          | 17th | 24th | 1st  | 8th | 15th | 22nd | 29th | 5th | 12th | 19th | 26th | 3th |
| Clear desk trial                         | 1 day    |      |      |      |     |      |      |      |     |      |      |      |     |
| Retention schedules issued for comment   | 8 hours  |      | ◆    |      |     |      |      |      |     |      |      |      |     |
| Comments on schedules and review meeting | 8 hours  |      |      | ◆    |     |      |      |      |     |      |      |      |     |
| Revised retention schedule issued        | 1 day    |      |      | ◆    |     |      |      |      |     |      |      |      |     |
|                                          |          |      |      |      |     |      |      |      |     |      |      |      |     |
| Days of action                           | 4.8 days |      |      |      |     |      |      |      |     |      |      |      |     |
| Review of activities and lessons learnt  | 10 days  |      |      |      |     |      |      |      |     |      |      |      |     |
| Review of clear desk operation           | 1 day    |      |      |      |     |      |      |      |     |      |      |      | ◆   |

Days of action will involve the examination and classification against the retention schedule of all documents and manuals held by each group member



**Invitation to meeting**  
**9th May**

**Teamwork meeting 18th May**

Since our last meeting on 4th April the events that we planned have been successfully happening.

- ★ The meeting to develop awareness of document and IT security and to launch the document retention and storage review was held on 10th April
- ★ The project team have subsequently developed a plan and commissioned the review using the services of a consultant

I would now like to organise a team meeting to address the next and final phase of our work as a team for the ECI pilot programme. I understand that Thursday, 18th May suits most of you and have booked Room 800 for that day. I propose we start at 0900 hrs and have lunch about 1230 hrs. A draft agenda is attached and a brief outline of the key elements in the final phase is given below.

- ★ Ensure that we understand the 'problem definition' phase of problem solving.
- ★ Do some cause and effect analysis using fishbone diagrams to identify underlying root causes.
- ★ Use the flowcharting process to understand the steps involved in achieving solutions to the root causes of the problems.

From the work we have done to date I have drafted a statement of our problem as a completed problem definition form. At our meeting on 18th May I would like to start with a brainstorm of from - to statements to qualify the elements of the problems we are dealing with. An example would be from computer screens left on unattended to computer screens not left on unattended.

Based on this brainstorm we will rank and rate to identify the key issues on the from list and then do one or two fishbones to identify the root causes of those issues, e.g. Why are computer screens left on unattended? We will follow this by using the root causes to identify the steps in a process flow chart to achieve the from - to movement to the desired result.

Please give some thought to items for the from - to list and I look forward to seeing you on 18th May.

**Case study**  
**3rd meeting**  
**18th may - Room 800**

**Agenda**

| <b>Time</b> | <b>Item</b>                                                                              | <b>Led by</b> |
|-------------|------------------------------------------------------------------------------------------|---------------|
| 0900        | Review problem definition using from - to analysis<br>Rank, rate and select key issues.  | Team leader   |
| 1000        | Develop an understanding of the key issues using<br>cause and effect (fishbone) diagrams | Facilitator   |
| 1100        | Flowchart the key issues of the from - to list and cause<br>and effect analyses          | Facilitator   |
| 1200        | Observations, review plan and status of task, and agree<br>next steps                    | Team leader   |
| 1245        | Lunch in Room 829                                                                        |               |

| Problem definition form                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                               |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Name</b> ECI                                                                                                                                                                                                                                                                                               | <b>Dept</b> CU/ERU                                                                                                                                                                            | <b>Date</b> April |
| <b>Outline definition of problem</b><br>Non-compliance with company document/IT security policy and procedures                                                                                                                                                                                                |                                                                                                                                                                                               |                   |
| <b>Who and what is affected?</b><br>Staff in the commercial unit and the ERU manager                                                                                                                                                                                                                          |                                                                                                                                                                                               |                   |
| <b>When and where is the effect?</b><br>The problem is current and is at staff work locations, and possibly during travel, with documents/laptop PCs, etc.                                                                                                                                                    |                                                                                                                                                                                               |                   |
| <b>What is the effect?</b> (e.g. costs, time)<br>Inefficiency in administering paper/reports, etc., overloaded document storage and breaches of security                                                                                                                                                      |                                                                                                                                                                                               |                   |
| <b>How big is the problem and is it getting bigger?</b><br>The problem is significant                                                                                                                                                                                                                         |                                                                                                                                                                                               |                   |
| <b>Supporting evidence</b><br>Inability to achieve clear desks, computers left on unattended, lack of awareness of company policy, document storage currently available is full with duplicate/unnecessary papers stored                                                                                      |                                                                                                                                                                                               |                   |
| <b>Results of investigations/fixes?</b><br>Corporate audit initially identified problem, pilot survey confirmed the problem in the commercial unit (anticipate problem exists throughout Construction). Team formed and to date have increased awareness of policy and commissioned a review of documentation |                                                                                                                                                                                               |                   |
| <b>Cost of problem?</b><br>Potential to reduce by 50% the storage space required in expensive office locations                                                                                                                                                                                                | <b>Likely resource required to solve it?</b><br>Training in awareness and compliance, plus document review: 30 man days (7 in team). CU: 20 man days (2 days per person. External consultants |                   |

## Key issues selected from problem definition review

### What is the problem?

#### Policy

- ★ Non-compliance with document classification IT security procedures
- ★ Risk of embarrassment
- ★ Exposure to criticism
- ★ Objectives changing/flavour of the month
- ★ No clear filing policy - paper or electronic?
- ★ Who is responsible? What to keep or not to keep?
- ★ Becoming a centre of excellence

#### Data

- ★ Out of date
- ★ Time lost in finding/knowning where/too much
- ★ Not considering alternative storage media
- ★ Duplication
- ★ Not knowing where to store
- ★ Where are the cost benefits?
- ★ Confidence in retrieving information from archives

#### Environment

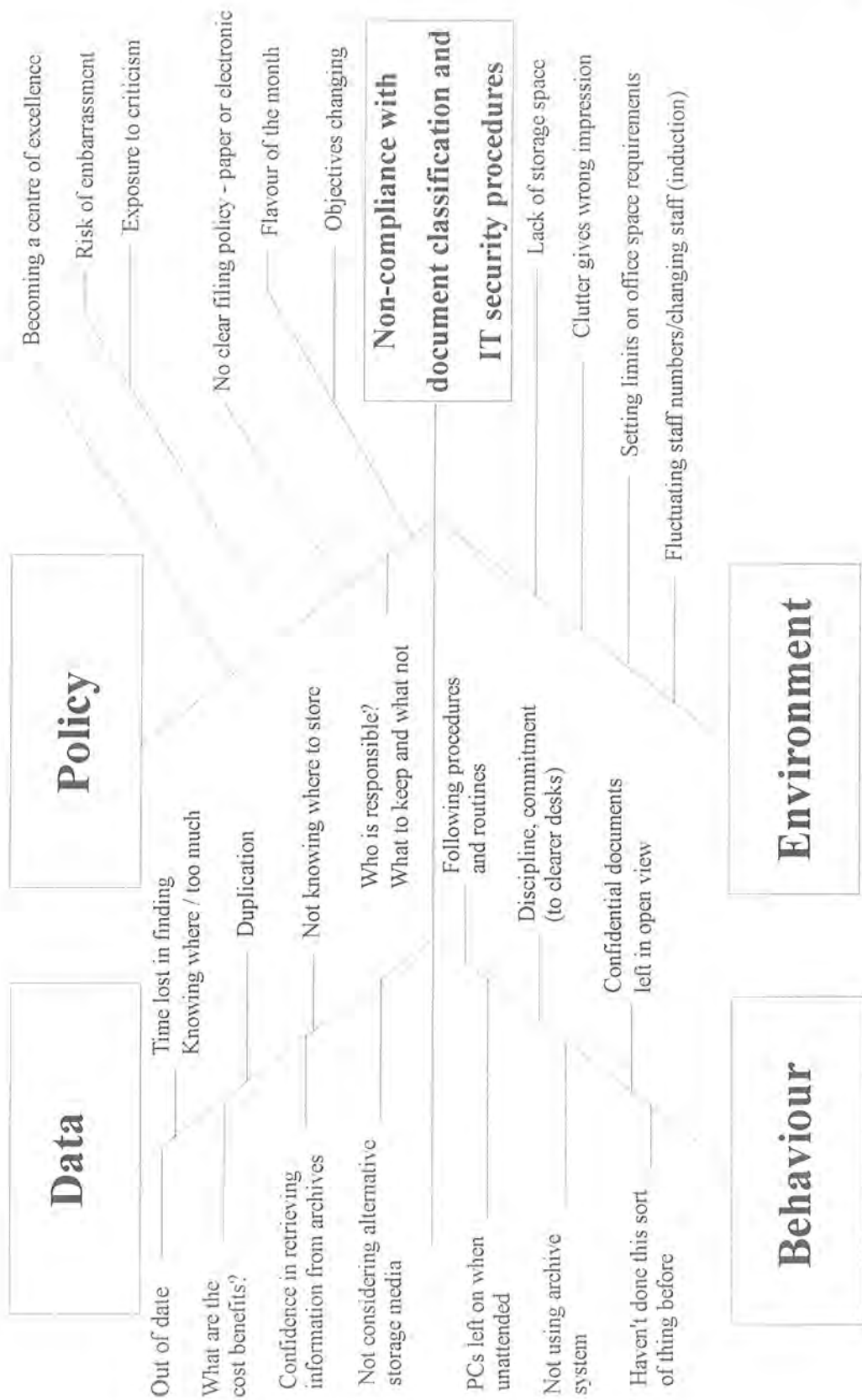
- ★ Lack of storage space
- ★ Setting limits on office space requirements
- ★ Clutter gives wrong impression
- ★ Fluctuating staff numbers/changing staff (induction)

#### Behaviour

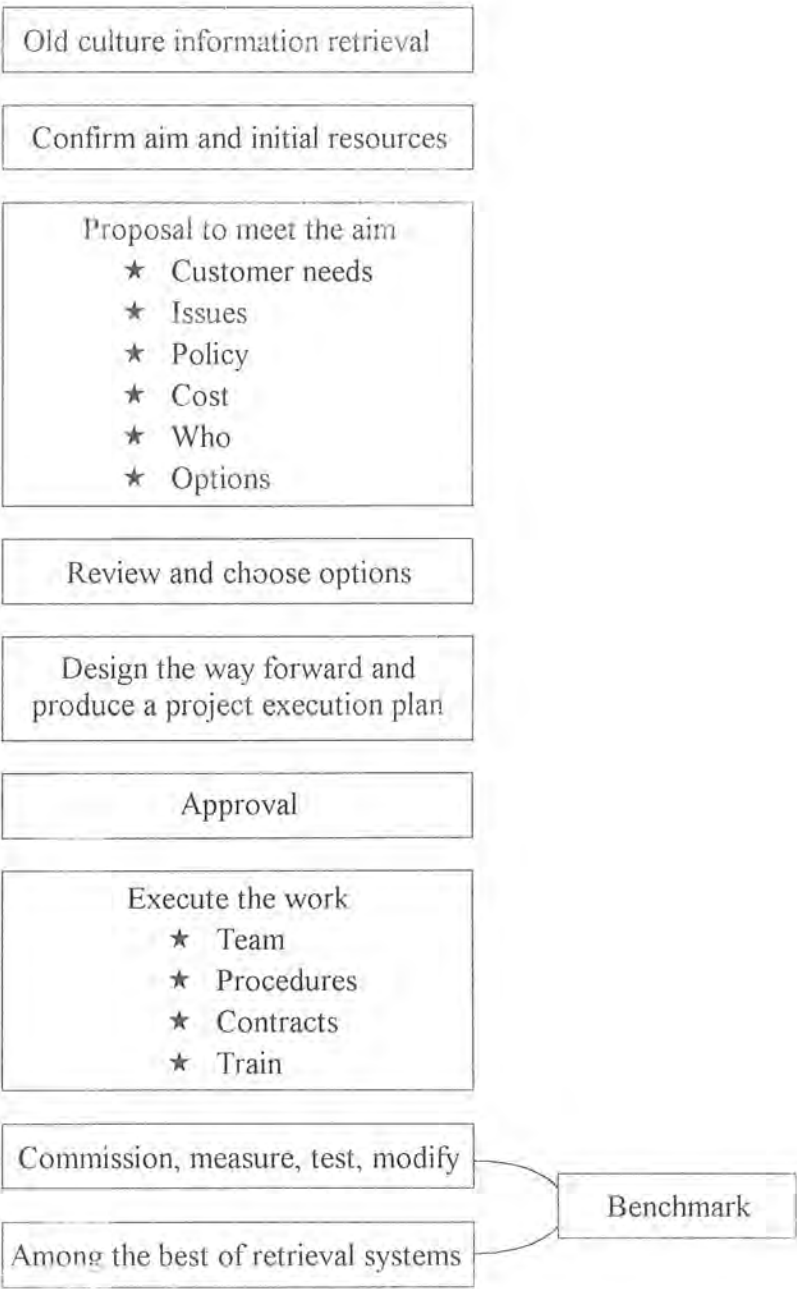
- ★ Following procedures/routines
- ★ Discipline, commitment (to clearer desks)
- ★ PCs left on unattended
- ★ Confidential documents left in open
- ★ Not using archiving system
- ★ Haven't done this sort of thing before

### What isn't the problem?

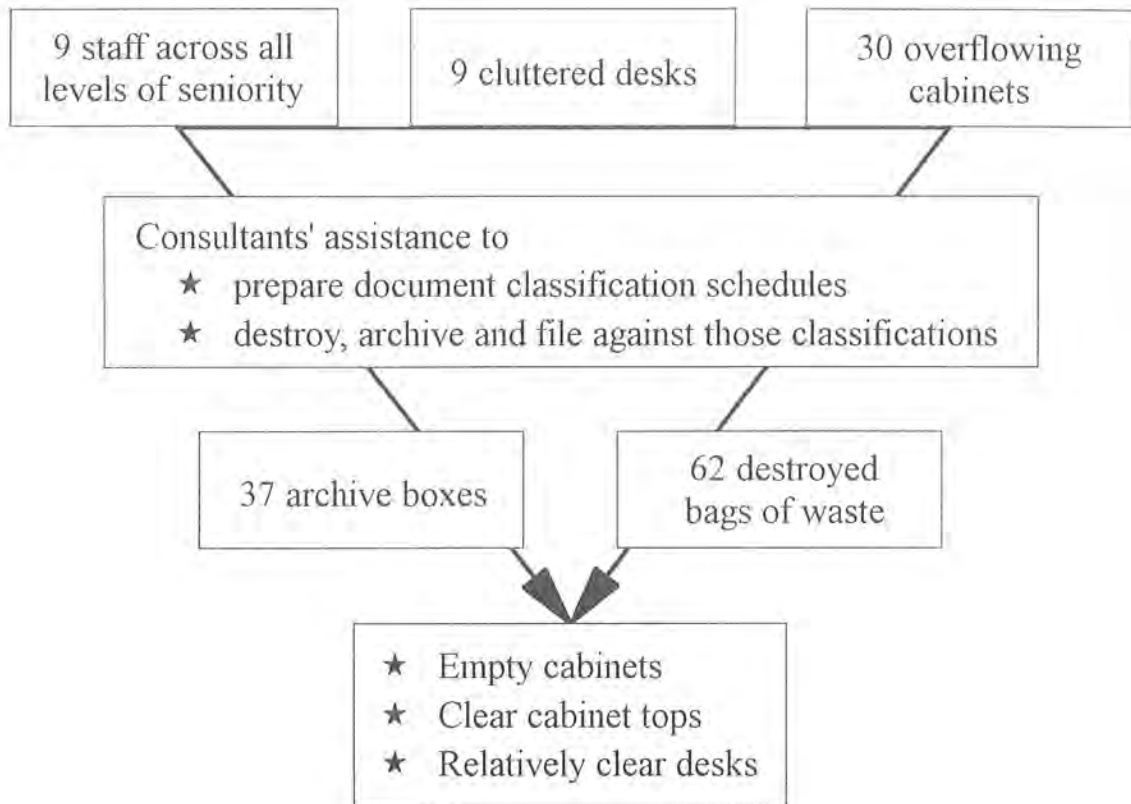
- ★ Doesn't affect all company policy
- ★ No major embarrassing problems to date
- ★ Lack of archiving system
- ★ General preparedness to do something once guidance given/facing the problem
- ★ Current office space
- ★ Support from director, IT technology is available, strategy is under review and some crude cost/benefit analysis is available
- ★ Current cost?



Steps to improve the information retrieval system



## Initial results from part completion



### **Description of the process of achieving the plan and comment about the tools**

The team met on two occasions to define the problem, develop an understanding of the root causes and to develop a plan to resolve key aspects of the problem.

The problem selected was a broad one including document and IT security awareness and moving towards a clearer desk policy through reducing documentation and providing more effective storage and handling.

The team identified two positive steps they proposed to action.

- ★ Four members of the team undertook to research company policy on document classification and IT security policy. They agreed to produce a guidance handout and to run a seminar for all members of a 30 strong unit. This they successfully did.
- ★ Three members of the team undertook to develop a plan, identify resources and execute the plan to achieve clearer desks. They reviewed their proposals with all affected staff at the seminar referred to above and upgraded their plan in the light of comments received. They then appointed a consultant to agree with members of staff 'document retention schedules' and to plan and carry out 'days of action' to achieve document reduction through implementing the retention schedules. Reduction was achieved through archiving, the elimination of duplication and the discarding of unnecessary documents. A major improvement has been achieved with clear cabinet tops, clearer desks and spare storage space resulting.

The problem was adopted by the team at their meeting on 4th April and the two positive action steps were completed by mid-June. The outcome was very successful and overall was a very powerful demonstration of what can be achieved with a little effort by a committed team. All team members continued to deliver in their normal jobs despite undertaking this pilot programme.

TQ tools used in achieving the above task

- ★ Brainstorming
- ★ Ranking and rating
- ★ Fishboning
- ★ Project planning
- ★ Facilitated meetings



## Observations

The general view was that the overall exercise had been very worthwhile and success could be classified as follows

### Task

- ★ The task was well planned
- ★ The strengths of the team were used
- ★ Team members were empowered
- ★ Communications were proactive
- ★ Overall team commitment was high
- ★ The task was successfully completed

### Process

- ★ The overall exercise provided learning opportunities for the whole team
- ★ The use of TQ tools and techniques was beneficial to improved team working
- ★ The continued application of the process rules the team developed will enhance future performance particularly
  - following the team charter
  - the use of observers
  - regular analysis and feedback by the observer and the team
  - well structured and facilitated meetings
  - the team leader and facilitator contract

Listening and supporting was seen as the key contributor to good teamwork.

Trying out ideas generally is the best way to find out if they work.

Constructive conflict can be beneficial - raising the temperature of debate often produces ideas that would not emerge in a more controlled discussion.

When in doubt refer to the team charter and if it doesn't help add another element to sort the problem out.

Remember it's a difficult process and don't get worried if things go haywire occasionally.



## 5. TQ in a construction project

### Why introduce TQ into a construction project?

- a) It is going to save the project money (and often time too)
  - ★ Fewer errors
  - ★ Less rework
  - ★ Reduced claims
  - ★ Faster and more informed decisions
  - ★ Less bureaucracy and paperwork
- b) It is going to mean better relationships between customer, contractors, suppliers and sub-contractors
  - ★ Less adversarial
  - ★ More open
  - ★ Freer flow of information
- c) It is going to give the customer a better project
  - ★ Lower cost (possibly earlier too)
  - ★ Less disputes
  - ★ Increased opportunities for design improvements

The case studies on pages 213 to 229 are examples of companies that have experienced these benefits by introducing Total Quality (TQ) into their projects.

The principles of TQ, which have been so successful in manufacturing, are equally applicable to the construction industry. Although projects vary in design, size, location and constraints, the project process from feasibility through to handover does not change. Many activities, such as procurement, commissioning and accounting, will be similar and can all profit from the ideas of TQ. The important component of TQ is people. The most profound effects of TQ come through changing attitudes, relationships and the way people work.

## **What qualifies as a construction project ?**

The construction industry comprises the building, civil, mechanical and electrical engineering companies and the specialist contractors, service providers and suppliers they employ.

Projects within the industry can range from a small workshop to a motorway, from re-wiring a house to building a power station. Whatever the size or type of project, there will always be a customer, a contractor and the provision of a product or service.

Typically, a construction project will include the following phases

**Feasibility**  
**Preliminary design**  
**Detailed design**  
**Construction**  
**Commissioning**

With the following activities occurring through all the phases to some degree

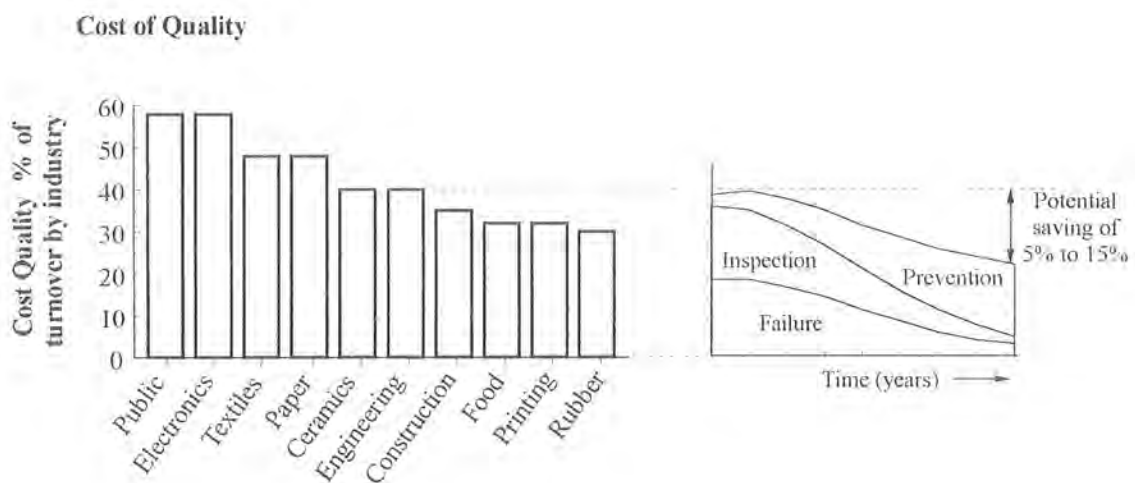
**Project management**  
**Engineering**  
**Regulatory compliance and safety**  
**Risk management and assumptions**  
**Procurement**  
**Construction**  
**Commissioning and operations**

## Cost of Total Quality

Total Quality requires an investment in people for the future, training as part the project.

Total quality is not a 'quick fix', it demands dedication and hard work. Total quality addresses 'company culture' and peoples 'attitudes' and these will not be transformed overnight. It focuses on meeting customer needs by continuously improving the quality of all the tasks carried out.

A major incentive for adopting Total Quality is the proven fact that it will not only increase customer satisfaction but will also provide financial reward. The savings that can be realised in the construction industry are typically 5% to 15% of turnover, as illustrated by the following graph.



## Key concepts

The following nine key concepts are considered by the task force to be central to running a TQ project

- ★ Teamwork
- ★ Leadership
- ★ Communication
- ★ Training
- ★ Empowerment
- ★ Alliancing
- ★ Benchmarking
- ★ Recognition and reward
- ★ Culture

These are based on interviews with twelve varied projects all attempting TQ and the industry experience of the task force members.

Each concept is only an outline of the main points. The reader is undoubtedly familiar with many of the topics and can find more detailed information on any of them in business libraries should they wish.

While many of these key concepts may be labelled as common sense, they are *not* common practice on construction projects. The case studies show the significant results of *really* applying some of these concepts.

## Teamwork

Total Quality is achieved through teamwork when a group of individuals work together to achieve a shared aim to the benefit of all parties connected with the project.

Teamwork can apply to specific project activities and specific groups of people or to a whole range of processes and activities in the project. Most large projects will contain many teams, involving the customer, contractor, sub-contractors and suppliers. Teams will be established both on and off site and will involve all categories of project staff.

### Benefits of teamwork

- ★ Better solutions through the pooling of ideas and knowledge
- ★ Co-operation, so less time wasted in non-productive conflict
- ★ More commitment by members to decisions made by the team
- ★ Even distribution of work, responsibility, effort and stress
- ★ More productive working by utilising the particular skills of the individuals that make up the team

Team size is important. The optimum as regards team dynamics is between five and eight people, for addressing specific issues.

Such teams should include

- ★ any affected by the issue
- ★ people with the abilities needed
- ★ a balance of personalities
- ★ those involved in implementing any changes



*Mud slung is ground lost !*

## Leadership

Project directors, managers and team leaders must pioneer Total Quality and encourage the involvement and initiative of others. In the most successful companies TQ is driven by strong leadership from the top.

If employees believe that they are expected to carry the burden of quality improvement for their project while their managers and leaders show by their behaviour a total lack of commitment, then a huge barrier exists to implementing TQ.

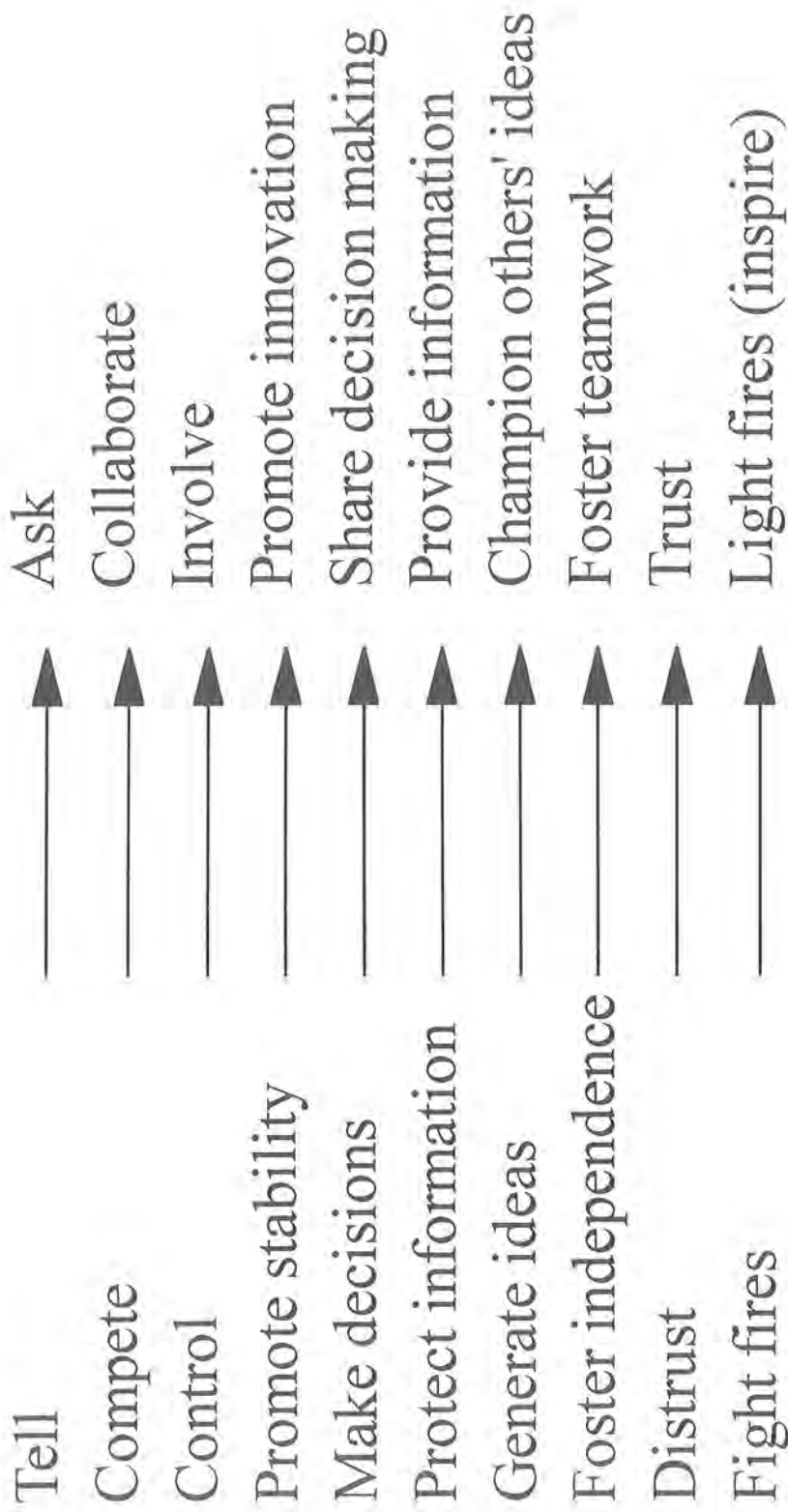
Experience has shown that the greatest potential for delivering quality improvement rests with employees at the lower levels of the organisation. The responsibility for not capitalising on this potential rests with management. It is the responsibility of all managers from the project director down to ensure that they provide an environment which will encourage involvement and initiatives from everyone.

Staff suggestions and the ideas of Quality Improvement Teams should be implemented as a matter of course (unless counter productive or excessively costly). Actions speak louder than words. There is no better way of stifling improvement suggestions than by dismissing them all.

*80% of TQ initiatives will fail because of lack of commitment to lead by example. Atkinson*



# The changing face of leadership



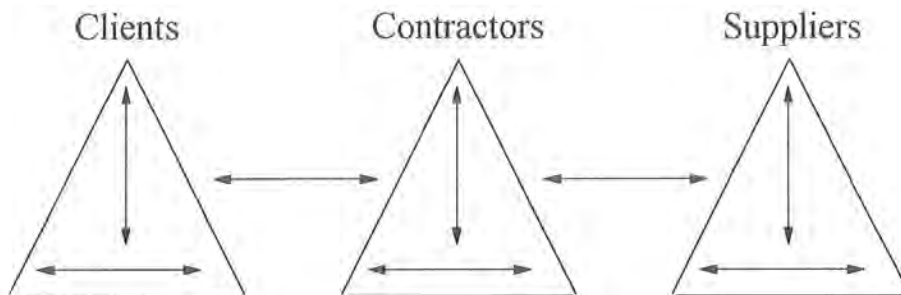
## Communication

Effective communication of information for all activities and at all levels is vital for a construction project. Consider the amount of information (drawings, specifications, procedures, contract details) and also the number of interfaces (client - contractor - supplier, design - construction - commissioning, manager - foreman - welder) that typify the industry.

With up to 25% of man-hours being spent exchanging information (meetings, conversations, instructions, reports) effective communication is key. Information must be clear, complete and accurate, conveyed concisely and in understandable language.

Communication is a two way interactive process. Listening and seeking feedback is as important as speaking and writing. Errors and expense are the results of not checking that

- ★ you properly appreciate what is being given to you
- ★ your information is fully understood



Effective communication must be up, down and across the project organisation, including design, manufacturing and site.

## Training

Training is an activity carried out to provide knowledge, develop skills or to change attitudes. It differs from 'education' as it adds a practical dimension.

Total Quality requires altering behaviours, management styles and work practices that have evolved over the years. This is a long process for which people need to be trained

- ★ progressively, starting with TQ awareness
- ★ at the appropriate time, so they can practice and apply their new skills at work
- ★ by a suitable method - training courses may not always be the best way, consider other options such as peer teaching, self learning and shadowing

In a Total Quality environment, we expect people to do the right things and to do them right first time. To do this, people need

- ★ to know what to do and why they are doing it
- ★ to know how to do it
- ★ to have the ability to do it

Appropriate training should be provided for all staff, even those with only a short commitment to the organisation, such as contract staff on site.

*Training should not be short term but a continuous reinforcement of the learning process. Menon*

## Empowerment

Empowerment is allowing the members of your team to carry out activities and take decisions on their own; decisions that do not require your approval. This allows individuals to use their creativity and skills and releases senior people to concentrate on other issues.

Here are examples of demotivating factors

- ★ Confusion
- ★ Lack of trust
- ★ Not being listened to
- ★ No time to solve problems
- ★ Bureaucratic office or site politics
- ★ A boss taking credit for others' ideas
- ★ Not enough resources to do the job well
- ★ Being continually interrupted and told how to do it

To counter these, here are three golden rules to empower others

- ★ Maintain self-esteem
- ★ Listen and respond with empathy
- ★ Ask for help in solving problems

Through empowerment, people gain responsibility in their individual jobs but the project manager or team leader still has to

- ★ know what is going on
- ★ set the direction for the project
- ★ make the decisions they cannot
- ★ ensure that people are on course
- ★ retain overall responsibility

# Alliancing

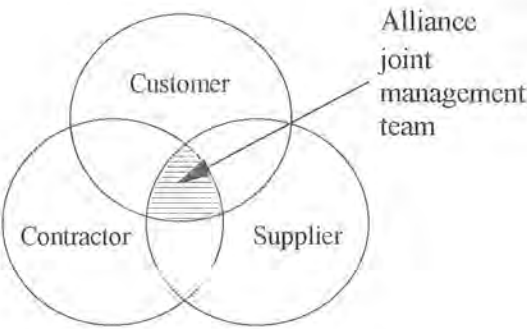
Alliancing (or partnering) describes the business relationship between customers, contractors and suppliers working together on a project (or several projects), sharing the risks and rewards.

By replacing the usual adversarial relationships with co-operative agreements, project costs are reduced.

- ★ No large costs associated with disputes and legal wranglings
- ★ Information flows more freely and openly between parties, avoiding errors, confusion and misunderstandings
- ★ Mutual understanding can lead to cheaper, more efficient and more constructable designs

Alliancing must be driven by and have the commitment of the top management of all the companies involved. It must be supported with a correct contractual framework.

A project can be run in a TQ manner without having to be an alliance, but alliances should be viewed as the ideal environment to gain the maximum benefits of TQ.



*Legal battles benefit one person only - The LAWYER !*

## Benchmarking

Benchmarking is the comparison of measured process parameters against internal and external performance.

*How can you know which way to go if you  
don't know where you are now?*

Parameters should be wider than the purely financial and include items such as customer satisfaction, rejection rates, process times, employee morale and material waste percentages. Select the parameters so that any improvements have a marked effect on the project and publicise progress.

The benchmarking process will look something like this for a new project

- ★ Decide what to benchmark
- ★ Decide who is to be responsible
- ★ Data collection
- ★ Analysis of performance gap

For more detailed information on project benchmarking see chapter 6.

## Recognition and reward

In a TQ project the role of recognition and reward should be well thought out. They can be used to raise morale, motivate and demonstrate the commitment of management to TQ.

*Above all, individuals must know that management seriously need their help and sincerely appreciates it. Crosby*

The traditional project environment is one of blame, mistakes are penalised, and achievement is considered to be part of the job and goes unthanked. Managers on a TQ project should strive to move away from this, to a more positive, no blame attitude. They should recognise and cultivate honesty about mistakes, speaking up instead of covering up.

### Recognition could be

- ★ a verbal 'well done'
- ★ a written commendation or letter of thanks
- ★ a public mention on notice boards or in a newsletter

### Reward could be

- ★ an opportunity to present their achievements to an interested audience
- ★ an event or day out
- ★ an engraved plaque or gift
- ★ improved working conditions (e.g. free coffee or an extra days' holiday)
- ★ bonuses or a percentage of the savings achieved

Rewards to individuals (especially financial ones) must be approached carefully; they can break up team spirit, and are also difficult to give fairly. Consider rewarding teams, groups and supplier companies.

## Culture

Culture derives from people's beliefs and ideas, and in turn this determines their attitudes and behaviour. In TQ cultural attitudes are of paramount importance and should characterise everybody involved in the construction project from the project director through to each member of the workforce. Attitudes to be fostered include:

*Customer focus* The customers' needs are met as far as contractual and commercial realities will allow; satisfying the customer is a primary objective in everything done on the project; there is a non-adversarial approach to problem solving. There are both internal as well as external customers. This means that those people that we provide a service to in our own organisation should be regarded as customers.

*Empowered* Each member of the project work force is empowered to be responsible and accountable for their own actions and are encouraged by management to use their skills, knowledge and creative talents to the full for the benefit of the project as a whole.

*Knowledge sharing* Everybody actively and generously communicates and shares knowledge and information with all other relevant parties on the project.

*No blame* There is a no blame, open, honest attitude to errors and mistakes with a view to swift correction and avoidance and improvement in the future. There is recognition that when mistakes occur, scapegoats should not be sought and management have a responsibility to the workforce to examine what changes may be needed in working processes to avoid re-occurrence.

Distinctive cultural attitudes often exist on sites, where the workforce has a large transitory component. Special care needs to be taken to develop a TQ culture that bridges, not reinforces, the divide between head office and site.



## Case studies

The following case studies are of four companies (from the twelve interviewed) that are implementing TQ on construction projects. The aim was:

- ★ to concentrate on a single project for each company (but this was not always possible)
- ★ to isolate some hard results from using TQ
- ★ to gather TQ advice and any lessons learnt

The task team is indebted to the individuals and companies involved for their assistance and enthusiasm.

## **Brown & Root**

ETAP & Andrew projects for BP, reported on 27th July 1995.

Interviewees: B. C. Liew, the project manager for ETAP

John Gregory, the project manager for Andrew

### **Project outline**

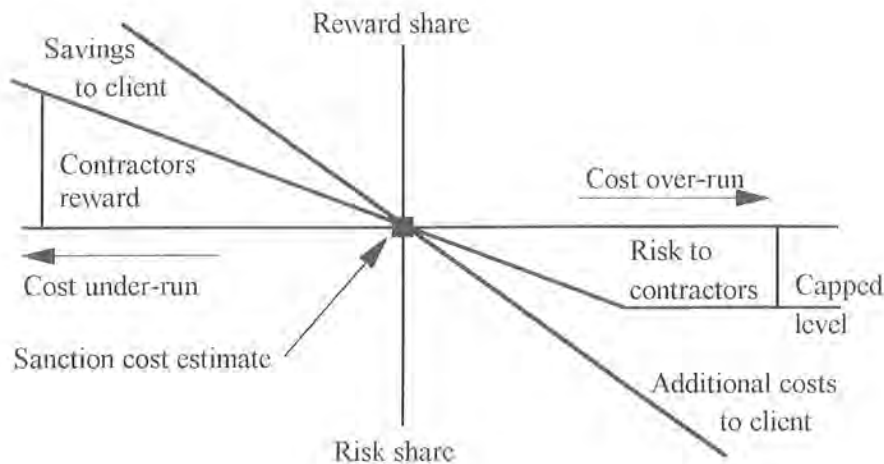
ETAP project (Eastern Trough Area Project) is an EPC project for the development of nine oil and gas reservoirs in the central North Sea, due east of St. Fergus. The project has a capital expenditure (CAPEX) of just under £1000 million for the facilities. Front end studies started in January 1995 and sanction is was in November 1995.

Andrew project is another EPC oil and gas project close to the Brae field in the North Sea with an estimated capital expenditure of £373 million. This project is currently more than 60% through its site construction phase.

### **Alliancing**

Both projects are alliances between BP, Brown & Root and other major contractors. Risks and rewards were shared according to the model below. Total Quality concepts and behaviour have been developed within Brown & Root over the past ten years and these are the foundation upon which the alliances stand.

### CAPEX - Risk and reward model for BP's ETAP project



### Benefits from Total Quality

The principle of alliancing on the Andrew project meant that the client, BP, provided Brown & Root and other alliance members greater freedom and flexibility in the project design and construction, thereby utilising the skill and flair of each alliance member with the following major benefits:

- ★ Reduced costs - on target to reduce costs by 20% against the budgeted CAPEX costs of £373 million through design rationalisations and teamwork among alliance members
- ★ Improved schedule - predicted first gas expected in July 1996, six months early
- ★ Less paperwork - 60% less documentation passed between BP & Brown and Root with estimated savings of £2.5 million
- ★ Less expediting or inspection - with TQ's emphasis on empowerment and getting things right first time, less expediting and inspection were required and savings of £2.5 million were made
- ★ £13 million saved on procurement through better relationships with suppliers

## Benefits of TQ to Brown & Root on the Andrew project

|                                 | Worse | Same | Slightly better | Much better |
|---------------------------------|-------|------|-----------------|-------------|
| Relationship with customer      |       |      |                 | ✓           |
| Relationship with suppliers     |       |      |                 | ✓           |
| Teamworking                     |       |      |                 | ✓           |
| Costs                           |       |      |                 | ✓           |
| Schedule / progress             |       |      |                 | ✓           |
| Claims                          |       |      |                 | ✓           |
| Communication                   |       |      |                 | ✓           |
| Morale                          |       |      |                 | ✓           |
| Productivity                    |       |      | ✓               |             |
| Customer satisfaction           |       |      |                 | ✓           |
| Industrial relations            |       |      | ✓               |             |
| Openness / no blame environment |       |      |                 | ✓           |
| Errors / rework / modifications |       |      |                 | ✓           |
| Attitudes to TQ                 |       |      |                 | ✓           |

### **Fabricators and suppliers**

On the Andrew project no design concessions were required because the fabricator was involved in the design phase. The benefits are that

- ★ structures were designed to aid fabrication
- ★ the fabrication team co-operated with the commissioning team, allowing commissioning to start before fabrication was complete

In selecting suppliers, price was important but more weight was placed on commitment, behaviour and positive attitudes. No late deliveries were experienced through the fault of suppliers. Better relations with suppliers resulted in goods being supplied on time and at lower cost.

### **Significant TQ statements from Brown & Root**

Total Quality - utilising the potential of all employees to give better value to the customer.

- ★ Savings are attributed to people by giving them freedom and individual responsibility
- ★ Success creates momentum for TQ
- ★ The enlightened TQ client releases opportunities
- ★ TQ questions everything: value, costs, programme
- ★ Alliance principle - to work in a spirit of openness and co-operation
- ★ The label Total Quality is not used nor is an alternative. The ideas and attitudes are fostered as good business practice

## **Balfour Beatty**

M25 widening from junctions 8 to 10, reported on 28th July 1995.

Interviewee: Neil Butterill, the business improvement adviser

### **Project outline**

The project involves widening of the M25 motorway between junctions 8 and 10. At the time of the interview the work had been under construction for five to six weeks. The contract was a design and build contract, which was a relatively new way of working for this type of job; traditionally the client would provide the design. The design lead in to the construction phase start had been sixteen weeks. The client in this instance is the Secretary of State for Transport. The contract is lump sum fixed price with a value of £93 million and a contract period of 126 weeks. The construction work is being carried out in fifteen discrete phases. With this form of contract, extras and claims might be expected to increase the final contract cost by perhaps 30-50%.

### **Introduction of Total Quality**

The managing director of Balfour Beatty is committed to the principles of TQ. He first shared his ideas for using TQ in Balfour Beatty in 1994 when he sent out messages to employees entitled *Towards year 2000* with his vision for greater customer focus, business efficiency, problem prevention and so on. The application of TQ principles on the project was a natural step.

Pressures for business improvement on the company included the need for cultural change, greater cost effectiveness and increased job satisfaction.

TQ on the project was initiated with a weekend in the Lake District bringing together Gifford Graham - the contractor's designer, W. S. Atkins - the client's representative, and Balfour Beatty - the contractor.

### **Project team selection**

Selection of the team members for this project was done on the basis of skills, experience and behavioural characteristics (using Belbin profiling). Whereas in the past, people had been selected on technical competence, qualifications and availability.

The project director has pioneered TQ on the project, with the business improvement advisor providing the methods, tools and techniques.

The company mission statement and TQ philosophy document was explained to each new project staff member. The project director visited and spoke with everyone within one week of starting. Each smaller team making up the overall project team was encouraged to develop its own set of TQ values and objectives, with Neil Butterill providing half hour to an hour TQ training sessions with facilitating and counselling to deal with conflict situations when they occurred.

**Benefits of TQ to Balfour Beatty hope to realise**

|                                 | Worse | Same | Slightly better | Much better |
|---------------------------------|-------|------|-----------------|-------------|
| Relationship with customer      |       |      |                 | ✓           |
| Relationship with suppliers     |       |      | ✓               |             |
| Teamworking                     |       |      |                 | ✓           |
| Costs                           |       |      | ✓               |             |
| Schedule / progress             |       |      | ✓               |             |
| Claims N/A                      |       |      |                 |             |
| Communication                   |       |      |                 | ✓           |
| Morale                          |       |      |                 | ✓           |
| Productivity                    |       |      | ✓               |             |
| Customer satisfaction           |       |      | ✓               |             |
| Industrial relations            |       |      | ✓               |             |
| Openness / no blame environment |       |      |                 | ✓           |
| Errors / rework / modifications |       |      | ✓               |             |
| Attitudes to TQ                 |       |      | ✓               |             |



### **Benefits from Total Quality**

- ★ No claims or disputes anticipated
- ★ Design and construction issues are discussed and resolved through consensus, an adversarial approach to problem solving is avoided
- ★ Open and honest culture demonstrated
- ★ Greater financial security for the company
- ★ Good morale in the workforce from greater enjoyment and satisfaction
- ★ Cost benefits through supplier partnership agreements
- ★ Improved communications

### **Quotes**

- ★ 'TQ is turning common sense into common practice, the aim is that in the future it will not be necessary to talk about TQ as it will be the accepted way of working'
- ★ 'TQ is hard work and a continuous process but business needs and work force morale demand it'
- ★ 'Our biggest frustration is finding time to address, train for and practise TQ'
- ★ 'TQ is hard to develop since project duration is twenty four hours a day for a two year period'

## **Galliford Midlands**

Mercury Communications project reported on 1st August 1995.

Interviewee: Chris King, the commercial director.

### **Project outline**

The Mercury telecommunications project undertaken by Galliford Midlands was for the civil and structural construction of about one hundred mobile phone cell sites and three switching stations with a total contract value of about £8.5 million. Galliford Midlands was contracted to do the detailed design, procurement and construction.

The contract was a fixed price, lump sum contract with the client introducing variation orders as required. The client/contractor relationship was a traditional one (i.e. no alliance or partnership).

### **Introduction of Total Quality**

Total Quality was introduced into Galliford Midlands by the managing director and commercial director four to five years ago and is now the established culture. Initially, a large consultancy firm was used to start the TQ programme and this was then further developed by Galliford Midlands. Today they have six of their own personnel who act as the company's TQ trainers. TQ training has been provided for all head office and site staff in the form of a two day training workshop at a nearby college using the company's own trainers.

The mission of the company is to be

- ★ good to invest in
- ★ good to do business with
- ★ good to work for

## Benefits From Total Quality

- ★ Broader viewpoint gained during design stage by early involvement of the design staff and input from the construction team. Key results were improved constructability and the design period reduced from four to three months
- ★ Lower material wastage at sites due to measurement and a continuous site effort to improve the use of materials, encouraged by competition between sites
- ★ Accounts department errors reduced by persistently identifying and eliminating the root causes
- ★ Quantity surveyors have reduced contract debts to Gallifords on work in progress from 30% to 18% of working capital
- ★ Flexible open relationship between Mercury and Galliford Midlands which has meant all conflicts have been resolved amicably - no claims
- ★ Fewer design staff required during detailed design due to close co-operation with the customer's designers

## Benefits of TQ to Galliford Midlands on the Mercury Project

|                                 | Worse | Same | Slightly better | Much better |
|---------------------------------|-------|------|-----------------|-------------|
| Relationship with customer      |       |      |                 | ✓           |
| Relationship with suppliers     |       |      | ✓               |             |
| Teamworking                     |       |      |                 | ✓           |
| Costs                           |       |      | ✓               |             |
| Schedule / progress             |       |      |                 | ✓           |
| Claims                          |       |      |                 | ✓           |
| Communication                   |       |      |                 | ✓           |
| Morale                          |       |      | ✓               |             |
| Productivity                    |       |      | ✓               |             |
| Customer satisfaction           |       |      | ✓               |             |
| Industrial relations            |       |      | ✓               |             |
| Openness / no blame environment |       |      | ✓               |             |
| Errors / rework / modifications |       |      |                 | ✓           |
| Attitudes to TQ                 |       |      |                 | ✓           |

### Significant TQ statements from Galliford Midlands

- ★ Those initially sceptical towards TQ have perhaps become stronger advocates than those who were enthusiastic at the start. A pragmatic view is best in the long run
- ★ The emphasis on measurement and continuous small improvements has been successful, probably because it focuses on work. Benchmarking provides good targets and motivators
- ★ Staff are encouraged to identify problems, not hide them
- ★ Previous attempted partnerships have not always been successful because the client has not been fully committed and has 'dug in their heels' when the relationship was tested
- ★ The project was technically complex and involved several parties, so good communication was important from the outset
- ★ Managing director and commercial director between them visited each site once a month
- ★ QITs that were set up at the beginning of the company TQ programme floundered for the first six months because they tried to tackle issues that were too broad. Starting on smaller problems has been much more successful

## **Ernest Ireland**

Reported on 18th September 1995.

Interviewees included: Stephen Bowcott, the managing director  
David Robertson, the chief engineer

### **Case study outline**

This case study is not based on a single specific project but on Ernest Ireland in general. Due to the small projects nature of the business, the benefits of TQ on any project can only be attributed to the company-wide TQ policy.

The company is a semi-autonomous business unit of John Mowlem Construction Plc with an annual turnover of £70 million. Most projects are either new or the refurbishment of industrial and commercial premises with values from £0.25 million to £25 million. Activity is centred around the South West of England and South Wales.

The company still retains the feel of the former family firm with a strong emphasis on training and teamwork.

### **Introduction of Total Quality**

In 1991 there was a harsh, top-down restructuring of the business. Employee numbers were reduced from six hundred to three hundred staff and from four hundred to two hundred operators. This caused a decline in morale and team spirit.

In 1992 the managing director started examining TQ, having been introduced to it on a residential course to see if it could

- ★ improve morale and re-establish the old family firm culture
- ★ deal with the challenges facing the business
- ★ introduce a framework to improve the company (which at the time was strong on cost, time and quality of product only)

A consultant was used to start off TQ. Eight people were trained by the consultant (including one sceptic), they then trained the rest of the company. Ernest Ireland took over running the programme, adapting the consultants model to suit their business. During this period the managing director was committing up to 40% of his time to ensuring TQ was embraced.

The company started by first looking internally by

- ★ surveys of staff, customers and the cost of quality
- ★ understanding each others needs
- ★ identifying and removing weaknesses of the system
- ★ instilling Quality as part of the company culture, before time and profit.

### **The TQ programme**

- ★ In the initial survey only 13% of staff thought the company was good at communicating. In response, the company now has a quarterly newsletter, a commercial bulletin every two months and a staff conference. On a second survey two years later the figure was up to 74%
- ★ The initial cost of quality survey isolated and costed £2.5 million lost due to poor Quality
- ★ Every employee is part of either a Quality Improvement Team (QIT) composed of their normal work group or a Quality Action Team (QAT). Their progress and results are published monthly
- ★ All sites have a separate monthly two hour quality meeting, addressing defects (a failure to meet customer requirements) caused by work and systems used at the site and by third parties
- ★ Recognition is given to the site, supplier, sub-contractor and department of the year at an annual awards ceremony. QITs and QATs celebrate their successes with an event - such as a day at the races
- ★ 15% of the company profits are divided among employees, so any money saved by improvements means more to share out
- ★ Company objectives include to train every staff member in TQ, to reduce the cost of defects by at least 10% each year and to involve all customers and suppliers in TQ
- ★ All implemented improvement actions are monitored each month to measure their success and permanence

## Benefits of TQ to Ernest Ireland

|                                 | Worse | Same | Slightly better | Much better |
|---------------------------------|-------|------|-----------------|-------------|
| Relationship with customer      |       |      | ✓               |             |
| Relationship with suppliers     |       |      | ✓               |             |
| Teamworking                     |       |      |                 | ✓           |
| Costs                           |       |      |                 | ✓           |
| Schedule / progress             |       |      | ✓               |             |
| Claims                          |       |      | ✓               |             |
| Communication                   |       |      |                 | ✓           |
| Morale                          |       |      |                 | ✓           |
| Productivity                    |       |      |                 | ✓           |
| Customer satisfaction           |       |      | ✓               |             |
| Industrial relations ★          |       | ✓    |                 |             |
| Openness / no blame environment |       |      |                 | ✓           |
| Errors / rework / modifications |       |      | ✓               |             |
| Attitudes to TQ                 |       |      |                 | ✓           |

★ Industrial relations have never been a problem in the past



### **Hard results**

- ★ £35,000 reduction in corporate paperwork
- ★ Increased negotiated work from 30% to 60%
- ★ 20% more invoices processed
- ★ Rejected invoices reduced from six hundred per month to four hundred per month
- ★ Theft and vandalism reduced from £9,000 per month to £1,000 per month
- ★ Estimated tender success rate increased from 1:6.2 to 1:4.3 (without reducing prices)
- ★ Retention held by clients reduced from £1.1 million to £600,000 per year - i.e. £0.5 million added to company cashflow

Quality is now considered to be part of the culture

Coming this far in three years is exceptional and can be attributed to the positive culture of the company at the start, the commitment and enthusiasm of the managing director, and the small project nature of the business. The company is now starting to look outside - asking suppliers how Ernest Ireland can improve and targeting customers and suppliers who cause the company problems (often without realising it).

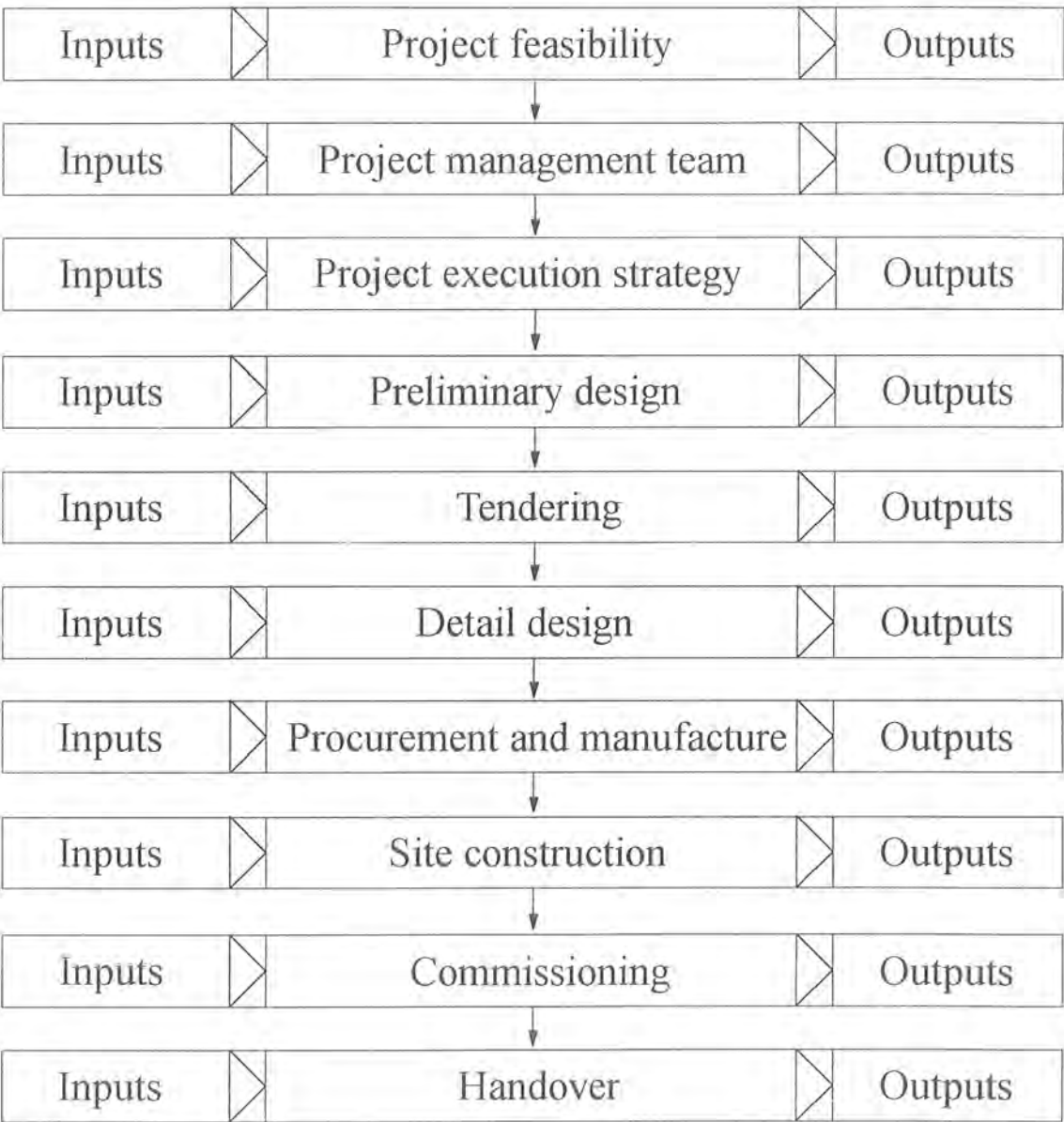
### **Learning points**

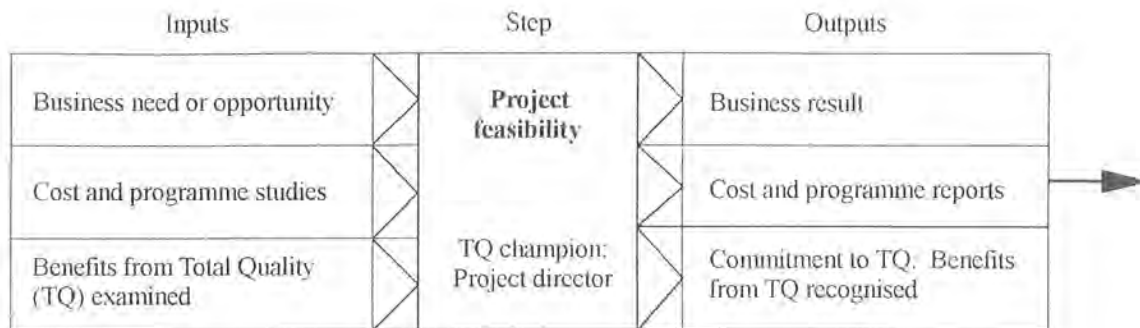
- ★ 5-10% of employees do not accept TQ. This can be accommodated provided that they are not subversive towards TQ
- ★ When starting a TQ programme, seek guidance from a consultant, then run the programme yourself
- ★ Define tasks very clearly for QITs and ensure early problems are manageable
- ★ Recognise both hard and soft results
- ★ Make decisions based on fact, not opinion
- ★ Renew surveys
- ★ QITs were generally led by the manager of the group but some teams successfully rotated the leadership
- ★ Start addressing internal issues before looking outside the company
- ★ Allow flexibility in the TQ structure to suit business and individual needs
- ★ Communicate results and the overall master programme

# The implementation of TQ in a construction project

The flowchart below provides a simplified outline of the main steps in a project without attempting to show the iterative processes which make up the sum of project activities. At the top of the following pages each of the main steps is expanded showing the input activities, particularly those needed to implement TQ in the project, and the outputs, again specifically identifying those which indicate the implementation of TQ.

Construction project TQ flowchart





### Project feasibility

At this stage the benefits of TQ in a project are examined and established and a commitment to TQ is made. Without a company TQ culture it will be difficult, if not impossible, to make this commitment. It is not realistic to expect to use a project to introduce TQ into a resistant company culture.

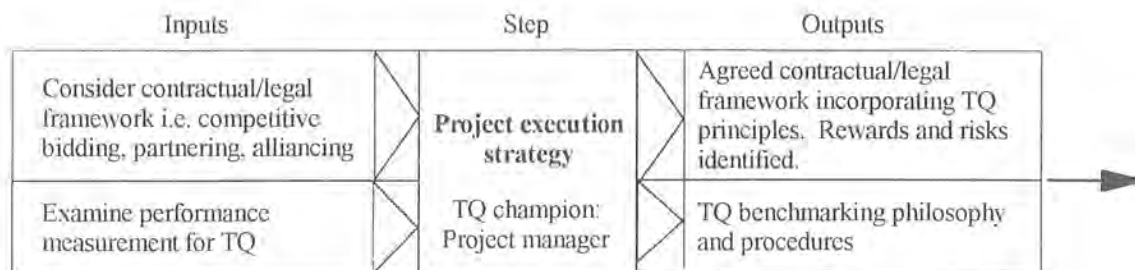
|           |                                                                                                          |
|-----------|----------------------------------------------------------------------------------------------------------|
| TQ issues | Commitment to TQ by top management<br>Visible TQ champion                                                |
| Tools     | Brainstorming<br>Ranking and rating<br>Flowcharting                                                      |
| Vehicles  | TQ awareness training<br>Learning from previous jobs and other companies                                 |
| Questions | What are the perceived benefits of TQ to the project?<br>What previous experience has the company of TQ? |



### Project management team

When the team is selected and the team structure established at management level, the application of TQ principles is important, as it is this team which will drive the whole project. Training and team building should begin at this point.

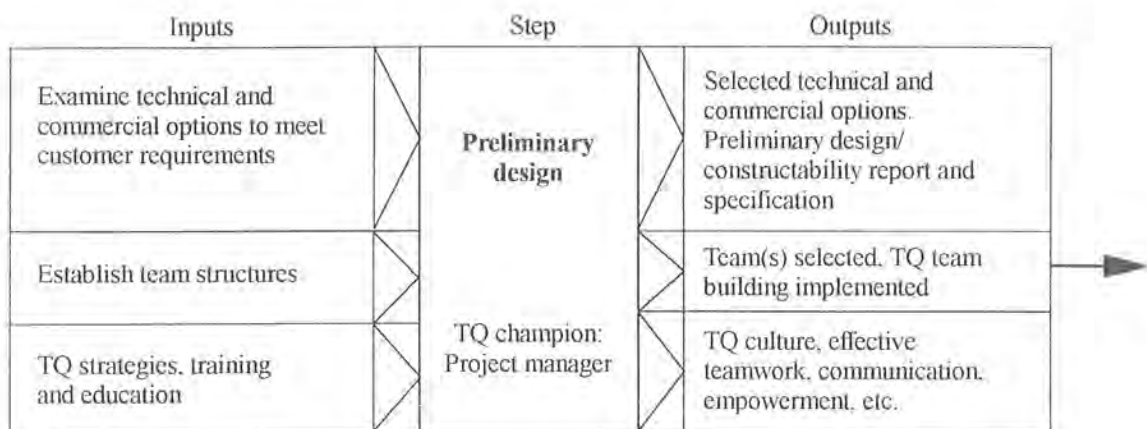
|           |                                                                      |
|-----------|----------------------------------------------------------------------|
| TQ issues | Team building                                                        |
|           | Leadership                                                           |
| Tools     | Belbin profiling for selecting a balanced team                       |
| Vehicles  | Workshops/events to build team                                       |
|           | Use of facilitators                                                  |
|           | Training in TQ awareness, leadership, meeting skills                 |
| Questions | How is the team to be selected - on skills, experience, personality? |
|           | What are the attitudes to TQ?                                        |
|           | Joint client/contractor management team?                             |



### Project execution strategy

The applications of TQ principles will have a major impact on the project execution strategy. In particular the strategy with respect to appointment of the main contractor and the contractual and cultural relationship between client and contractors will be determined at this stage. Ideally the contractors should be appointed in time to contribute to the preliminary design, but if this is not possible then the preliminary design must be flexible enough to permit a later meaningful input from the contractor. To initiate the relationship, a kick-off workshop between client and main contractors should be planned, where all parties air their objectives and concerns.

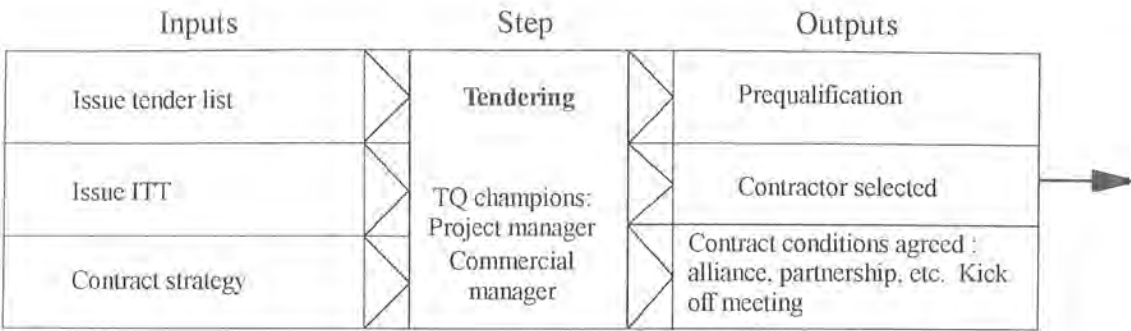
|           |                                                        |
|-----------|--------------------------------------------------------|
| TQ issues | Relationships and strategies defined                   |
| Tools     | Brainstorming                                          |
|           | Ranking and rating                                     |
|           | Cause and effect analysis                              |
| Vehicles  | Team bonding events - lunches, sport, etc.             |
|           | Workshops                                              |
|           | Publicity                                              |
| Questions | What type of relationship and contract are to be used? |
|           | Why, what are the objectives?                          |
|           | How to share risks, rewards and responsibilities?      |
|           | What will be measured?                                 |



### Preliminary design

Training and team building must continue as the team grows. The structure of contractor teams and the TQ implementation strategy should be fixed. By now there should be good communications, empowerment and progress towards the establishment of measurement and benchmarking policies. Contract designs and reports should be produced at this stage and the benefits of TQ may be becoming evident.

|           |                                                                                                                                                                                           |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TQ issues | Customer focus<br>Communication                                                                                                                                                           |
| Tools     | Decision aiding tools - pareto analysis, cost-benefit analysis, critical success factors, failure prevention analysis, solution effect analysis                                           |
| Vehicles  | Publicity - newsletter, novelties, posters<br>Lunch time training sessions<br>Facilitator training<br>Measurements<br>Quality improvement teams                                           |
| Questions | What training/bonding/selection procedures?<br>How to attain teamwork, openness, no blame culture?<br>How to deal with sceptics and resistance to TQ?<br>What are agency staff attitudes? |

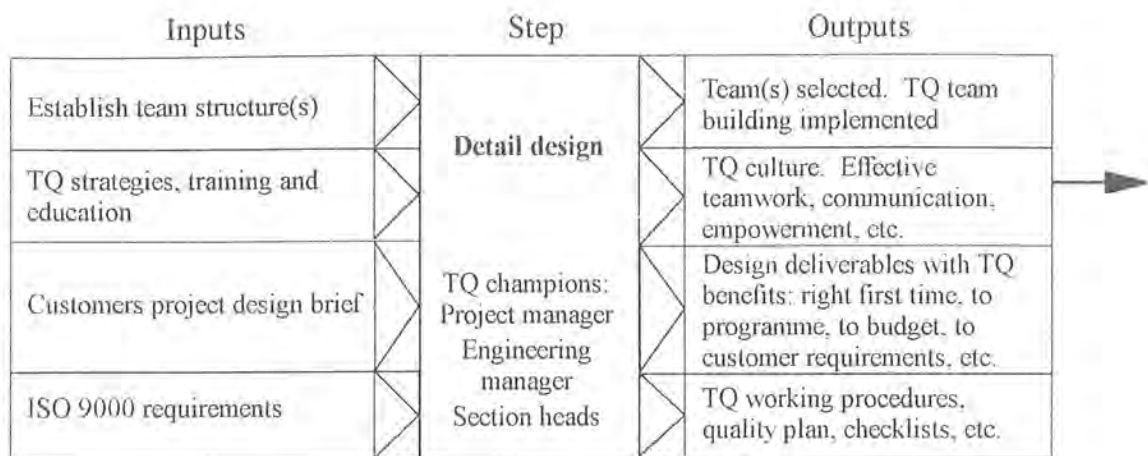


**Tendering**

The main contractor should now be bound into the team structure with a design to which they have contributed or will be able to, and a contractual relationship which is suitable for mutual advantage and risk. From the contractor's point of view it is essential to have a company TQ culture and commitment to allow them to enter into this situation. It seems clear that if either party is unable or unwilling to commit themselves to the principles of TQ in the project, the chances of a successful implementation of TQ are reduced. However an individual organisation can achieve some of the benefits of TQ working on its own and concentrate on developing its TQ skills and culture.

The contractor's marketing, business development and tendering processes which have brought them to this stage should have been executed in a company TQ culture with the intention of applying TQ to the project. The marriage of similar intention and cultures could result in a passionate commitment to TQ and joint success.

- TQ issues    Good working relationships
- Costs and non-monetary factors
- Tools        Cost benefit analysis, ranking and rating, surveys
- Critical success factors, force field diagrams
- Vehicles    Briefing workshops
- Presentations
- Questions    What are bidders attitudes to partnerships/alliances?
- Any emphasis on TQ when evaluating bids?

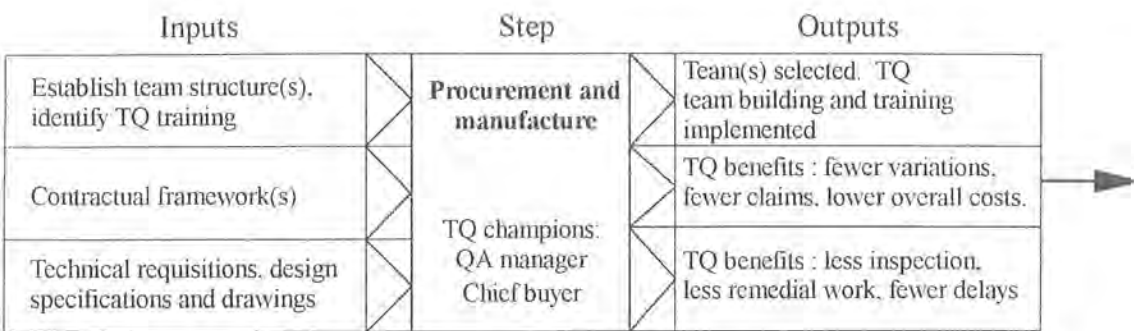


### Detail design

The joint client/contractor team is now working on the detailed design. The TQ inputs to develop the culture should continue and the benefits should start to appear in improved deliverables. The Quality System requirements at this and other stages are compatible with and complementary to TQ. The project engineer/engineering manager and lead engineers should now be implementing TQ through teams and developing teamwork, empowerment and communication.

|           |                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| TQ issues | Commitment by middle management<br>Empowerment, valuing employees<br>Fitness for purpose, right first time                                                |
| Tools     | Cost benefit analysis<br>Suggestion schemes                                                                                                               |
| Vehicles  | Social events to celebrate milestones with support from company<br>Managers practising what they preach<br>Measurements<br>Quality Improvement teams      |
| Questions | What training/bonding/selection procedures used?<br>How to get the right attitudes - teamwork, openness, no blame environment?<br>Agency staff attitudes? |

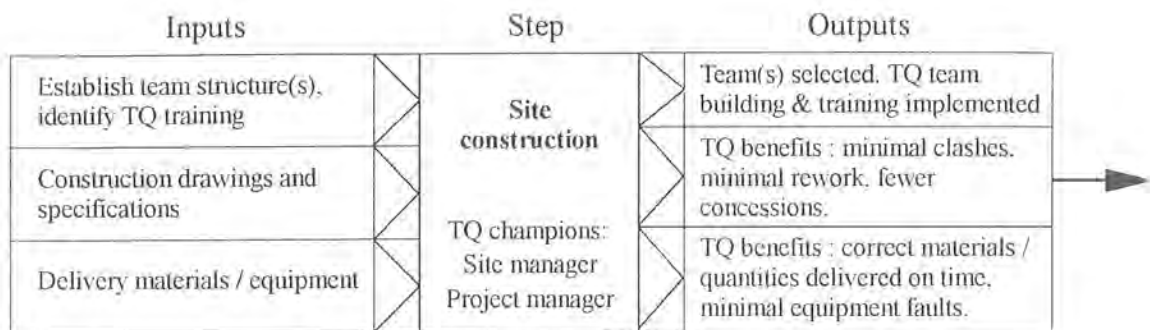




### Procurement and manufacture

The contractor's procurement strategy should also be in accordance with TQ principles. Manufacturers, suppliers and subcontractors are appointed within suitable contractual frameworks to contribute to project successes. Again inherent company TQ culture is important so training and team building must continue but now on a joint basis. As before the suppliers should be co-operating in the detail design as well as the manufacture, and benefits of improved design, fewer variations, lower cost, fewer delays and less inspection should be possible.

- TQ issues    Good relationships between client, contractors and suppliers
- Empowerment
- Tools        Supplier surveys
- Workshops
- Vehicles    Training in meeting skills
- Measurements
- Quality Improvement Teams
- Celebrate milestones
- Questions    How are suppliers to be selected? Role of ISO9000?
- What type of contract and conditions?
- What are their attitudes towards TQ?



### Site construction

With the move to site new challenges have to be faced and experience shows that implementation of TQ on site needs real commitment by the site manager. This may be due to the more traditional attitudes and the prevailing culture on site, coupled with a more transitory work force. A co-operative approach to subcontractors is important and the implementation of joint training, teamwork, improved communications and empowerment of teams has to be further developed.

Special thought should be given to overcoming the construction site /design office cultural divide. Again the TQ benefits of reduced clashes, minimal rework, fewer concessions, minimum faults, timely deliveries and completion, all at lower cost should be achievable.

Sharing of benefits between all contributors is important.

|           |                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| TQ issues | Win-win relationships, teamwork, health and safety<br>Waste is evil, reduced conflict, empowerment<br>No blame environment, working together     |
| Tools     | Suggestion schemes, scatter diagrams, brainstorming<br>Employee surveys, programme wallchart, check sheets                                       |
| Vehicles  | Facilitated meetings, top management visits to site<br>Communication of big picture to all, measurements<br>Milestone events - family days, QITs |
| Questions | Conflicts - likely causes and how to deal with them?<br>What benefits do you seek from TQ during this stage?                                     |



### Commissioning

The establishment of joint commissioning teams supported by the training and cultural development already established should continue to provide TQ benefits. The integration of operational staff within commissioning teams should be encouraged in a TQ project.

|           |                                    |
|-----------|------------------------------------|
| TQ issues | Rewards and recognition            |
|           | Health and safety                  |
|           | Time pressures                     |
| Tools     | Systematic problem solving process |
|           | Brainstorming                      |
| Vehicles  | Learning points for future jobs    |
|           | Milestone events                   |
|           | Bonuses                            |
| Questions | How will TQ endure time pressures? |

| Inputs                                    |  | Step                                                                        |  | Outputs                                                |
|-------------------------------------------|--|-----------------------------------------------------------------------------|--|--------------------------------------------------------|
| As built documentation from design group. |  | <b>Handover</b><br><br>TQ champions:<br>Project manager<br>Project director |  | Operators accurate as-built database                   |
| Feedback meeting, close out reports       |  |                                                                             |  | Improvement plans for TQ in future. Customers comments |
| Benchmarking criteria                     |  |                                                                             |  | Benchmarking measurements. TQ benefits evaluated       |

### Handover

The provision of accurate as-built data, the orderly closure of the project, feedback, analysis and future co-operation should result from the continued application of TQ at all levels.

|           |                                                                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| TQ issues | Rewards and recognition<br>Feedback and lessons for future work<br>Customer satisfaction and repeat business                                         |
| Tools     | Systematic problem solving process<br>Client survey<br>Brainstorming, cause and effect analysis                                                      |
| Vehicles  | Client feedback meeting<br>Publicity, presentations, opening ceremony                                                                                |
| Questions | What is your general conclusion of TQ? Benefits?<br>What is the customers view of TQ? Repeat business?<br>How many times were contracts referred to? |

### Conclusion

The above narrative describes an ideal project. It would be fatuous to suggest that everything will happen perfectly the first time it is tried. Mention is frequently made of the need for cultural change and this inevitably takes time and effort. However, many of the benefits described have been achieved in real projects. With perseverance and a programme for continuous improvement more and more benefits will be realised.

## 6. Benchmarking the construction project process

### Introduction

#### What is benchmarking?

Benchmarking can be defined as

*A process of identifying, comparing and learning from 'best in class' products, services and practices to set an agenda for change and promote a culture of continuous improvement within an organisation.*

Benchmarking, at its simplest, may be no more than an informal meeting between representatives of two or more companies to exchange experience and information about a topic of interest. It can be of value where the issue is clearly defined, information is readily available and the objectives of all parties are limited.

A more formal approach to benchmarking entails systematic comparison of detailed information between organisations, and this may be of two types.

- ★ **Process benchmarking** which is a comparison of individual practices with best practice among benchmarking partners as a means for learning and improvement.
- ★ **Performance benchmarking** which is a comparison of time, cost or other measurements required for completion of specific actions within a generic process model of best practice. The extent to which performance benchmarking can be applied varies as follows:

Between identical construction projects every activity can be benchmarked.

For similar but not identical construction projects, for example electricity generating plant or commercial developments, time or cost indices can be developed as benchmarks.

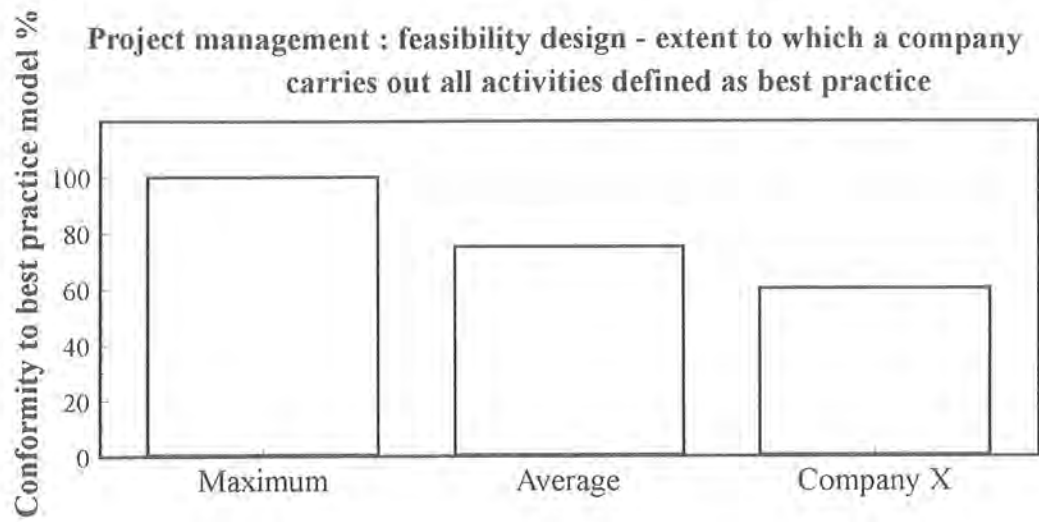
Between dissimilar construction projects, activities that can be performance benchmarked are likely to be limited to such generic categories as standard business functions (e.g. payroll) or to trade skills where these can be broken down to their most basic elements.

Process and performance benchmarking are related and one may lead to the other. For example, a construction client whose project is performance benchmarked against another may find it inferior in terms of time, cost or quality. This might then stimulate systematic examination of business processes to see how they could be improved. Likewise, the aim of process benchmarking is to improve performance and that is why it must include ways of assessing whether processes are both effective and efficient and help identify activities that can be performance benchmarked.

**What is a benchmark?**

For process benchmarking, a benchmark is a detailed description of all the activities that constitute best practice. This can relate to a project or a defined phase of a project.

The key measurement is the extent to which the company carrying out the benchmarking conforms to this model of best practice. This will generally be expressed as a percentage.



For performance benchmarking, a benchmark is a number which expresses the level achieved in that activity by a company which is considered to represent best practice for that activity, often compared with an industry average. An example is given below.

| Office buildings : benchmarks of construction performance |                                                |
|-----------------------------------------------------------|------------------------------------------------|
|                                                           | square meter gross construction added per week |
| UK average                                                | 180                                            |
| UK fastest                                                | 725                                            |
| US average                                                | 230                                            |
| US fastest                                                | 505                                            |

Source : University of Reading

### **How is benchmarking carried out?**

A company cannot benchmark a single construction project in isolation. At least one other project is essential and several are preferable.

Benchmarking also raises questions of legality and commercial confidentiality and it therefore should be conducted using a recognised code of conduct. An example of such a code can be found in Addendum J of this handbook.

After management commitment to the benchmarking process has been made, there are five principal stages to the benchmarking process. These are planning, data collection, analysis, acceptance and action. (see benchmarking flowchart on page 244). They apply whether process or performance benchmarking is the chosen tool.

*Planning* involves the identification of areas of concern and the choice of particular area(s) to be studied. This is followed by detailed analysis of the company's own process(es), without which it is unlikely that any meaningful comparisons can be made. From this analysis, questions will be formulated relating to the objectives of the benchmarking study and based on how activities are currently carried out. Sources of benchmarking data are then identified which will provide information relating to these questions.

For process benchmarking, this might be found in a best-practice model with an established database or might need to be specifically generated with benchmarking partners. For performance benchmarking, this entails the identification of the 'best in class' company for this activity. Finally the benchmarking plan needs management commitment and the allocation of the necessary resources to complete all subsequent stages within an agreed timeframe.

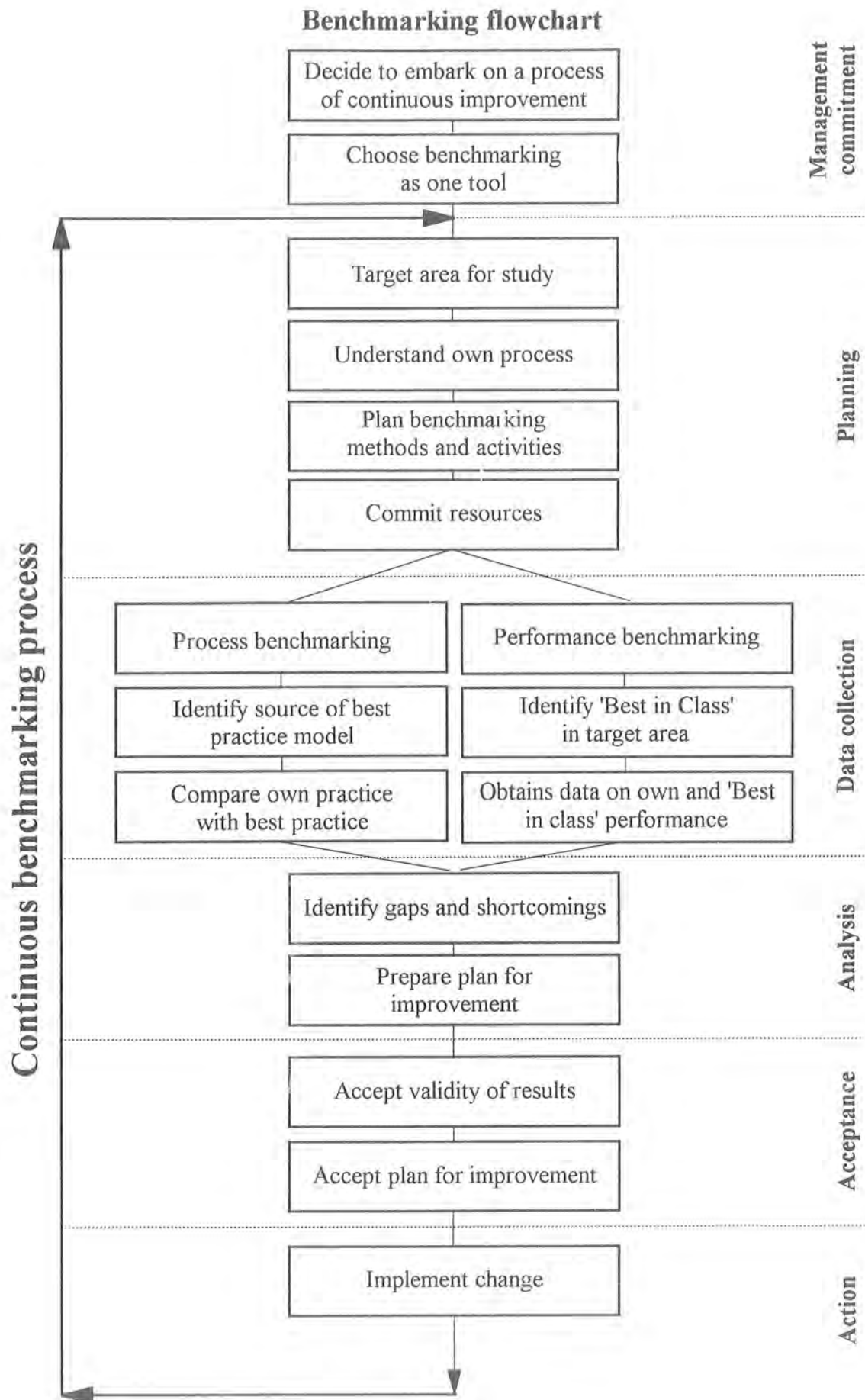
*Data collection* will be based on the previously formulated list of questions. It may take a number of forms depending on the type of benchmarking being conducted and whether the required data is already available. The main options for answering the questions include postal and telephone surveys, visits to or meetings with benchmarking partners, and joining or establishing benchmarking clubs.

*Analysis* of the data gathered involves a detailed and careful study of the differences between the company's own processes and those of other companies. The reasons for differences must be identified. Successful benchmarking is not achieved through copying the work of those studied but through a complete understanding of the differences.

*Acceptance* is the phase when the company accepts the results of the data collection, in particular where it identifies gaps between it and the best practice model or the best-in-class, and prepares a case for improvement.

*Action* is then taken to put into effect improvements in processes and activities. The whole process can then be repeated, putting the company into a cycle of continuous improvement.







### **Benchmarking in other industries**

Both process and performance benchmarking have long been important tools for improvement in the manufacturing industries. Repetitive activities and standardised products lend themselves more easily to the collection of data relating to processes and to product characteristics such as cost, time and quality. Performance benchmarking has also been used to diagnose shortcomings in business processes, which have then been subjected to process benchmarking.

The wide disparity between construction sectors and the fact that almost every construction project is unique, means that performance benchmarking of the type practised in manufacturing industries is not widely applicable to construction projects. However, process benchmarking is more easily achievable, and at high level will lead to the identification of some performance measures relating to process efficiency and process effectiveness.

### **Process benchmarking**

Process benchmarking commences with the establishment of a generic model of best practice for a selected operation, after which the participating company compares its own practices against this recognised standard. During this comparison process, the participating company is able to identify shortcomings in its own practices and take steps to change them. This is an important part of the cycle of continuous improvement.

Where possible, measures of process effectiveness and of process efficiency should be established. These will clarify the relationship between following best practice, the resources required to do so, and the achievement of good results on a particular project.

### **Performance benchmarking**

Performance benchmarking commences with a thorough understanding of the activity or product under consideration. A 'best in class' company carrying out this activity is then identified and comparisons are made. The results identify performance targets which, in turn, lead to the development of improved activities and processes.

## **Benchmarking in the construction industry**

### **Existing benchmarking activities**

Benchmarking has been applied by a small number of large international companies in the construction industry since the mid-1980s. One of the first of a number of companies was DuPont, who have been engaged in structured performance and process benchmarking with international partners for several years. As a result, DuPont have transformed their business processes, leading to a major improvement in project performance.

Benchmarking is now coming to be recognised as a useful tool in the construction industry in the UK. A number of initiatives are being taken by a range of organisations including industry associations, research and academic institutions, individual firms and private benchmarking clubs. Some of these are funded by government, in particular the Department of the Environment's construction benchmarking challenge.

## **The ECI benchmarking initiative**

### **The ECI measurement and benchmarking task team**

The ECI established a measurement and benchmarking task team, consisting of a mix of representatives from client and contractor companies, in 1994 as part of its initiative on Total Quality in construction. It was recognised that benchmarking of the construction process could lead to general improvement throughout the industry. Historically, productivity in construction has been low, and benchmarking is seen as a way of stimulating and underpinning improvements in the construction process.

Because the construction industry consists of several distinct sectors, all of which have different characteristics and operating methods, it was decided to develop a high-level model of best practice for the project process to be applicable to all sectors. This model was tested and refined at meetings with a range of clients and contractors. Methods of measuring process effectiveness and efficiency were also produced, based on an assessment of the critical and measurable activities from this model of best practice.

Performance benchmarking related to particular parts of the overall process model, for example construction productivity, is being undertaken by other ECI task forces. The work of the ECI's productivity task force includes best practice recommendations specifically aimed at improving project productivity, with a detailed self assessment procedure. The ECI's estimating task force has produced location factors for the UK, Germany, France, Belgium and the Netherlands based on analysis of typical process plant.

## **The ECI benchmarking model**

The ECI model assumes that a project consists of five phases

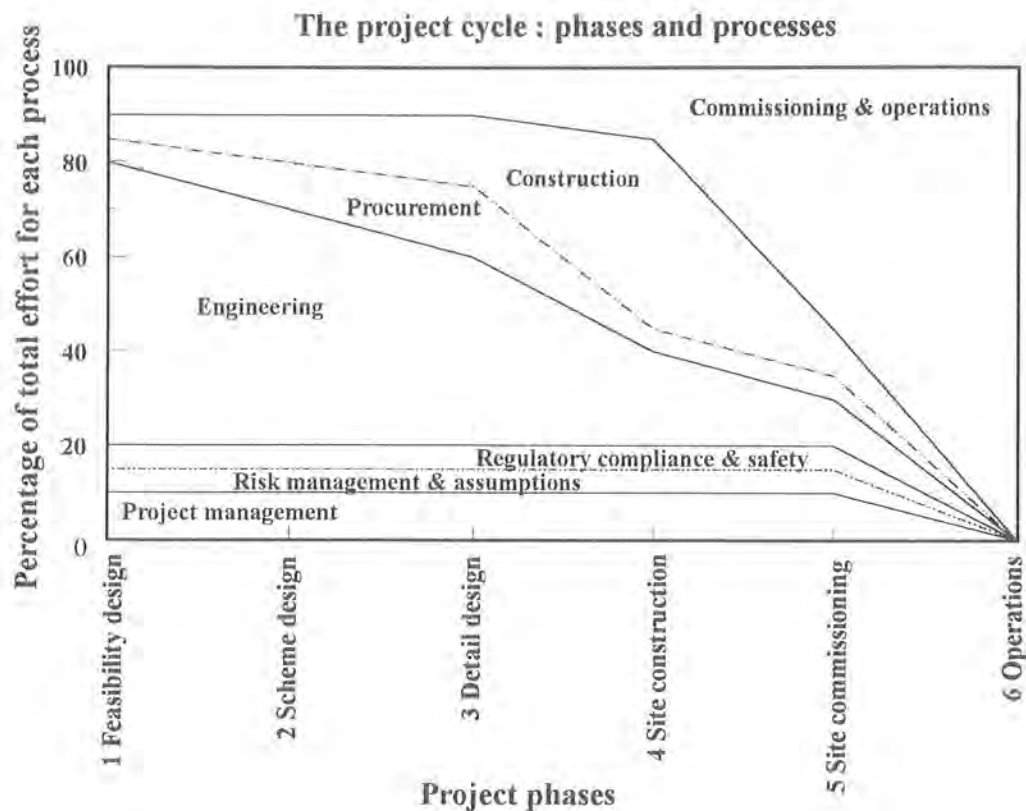
- ★ Feasibility design
- ★ Scheme design
- ★ Detail design
- ★ Site construction
- ★ Site commissioning

The total development, however, also includes site operations and decommissioning and some aspects of these have to be considered during the project phases. Detailed definitions of these and other terms used can be found in Appendix M.

Throughout the project, there are a number of key processes that run through the five phases and, in some cases, beyond the commissioning phase and into operations. These are

- ★ project management
- ★ engineering
- ★ regulatory compliance and safety
- ★ risk management and assumptions
- ★ procurement
- ★ construction
- ★ commissioning
- ★ operations

At each phase of the project, the amount of effort demanded by each process varies, as the following diagram illustrates.



Within each process and phase, there are a number of activities that should be carried out as part of a best practice project. These collectively constitute a generic model of best practice for the entire project cycle from which a process benchmarking questionnaire (see Appendix K) has been developed.

Questions relating to measures of process effectiveness and process efficiency are also included in the questionnaire in order to place the results in the context of project performance.

### Relationship to the benchmarking steps

The ECI benchmarking initiative is designed to help companies with the first three of the benchmarking stages.

|                 |   |
|-----------------|---|
| Planning        | ✓ |
| Data collection | ✓ |
| Analysis        | ✓ |
| Acceptance      |   |
| Action          |   |

Acceptance and action must be addressed by the company.

### Extent of benchmarking activity

Benchmarking can be carried out at five different levels, depending on the extent of comparison with other companies and the level of independent auditing used.

**Level 1** *A simple, unaudited self-assessment of a single company.* This will give a first indication of the extent to which the company conforms to best practice. It will not include comparisons with other companies and will inevitably run the risk of being subjective. The results of the process effectiveness and process efficiency measures will be meaningless as there will be no comparitors.

**Level 2** *Unaudited self-assessments of more than one company.* This option will allow comparisons between companies, but again, these will inevitably be subjective and therefore the comparitors will not be comparing like with like.

**Level 3** *An audited assessment of a single company.* This will eliminate the risk of subjectivity, but the process effectiveness and process efficiency measures will still be meaningless as there will be no comparitors.

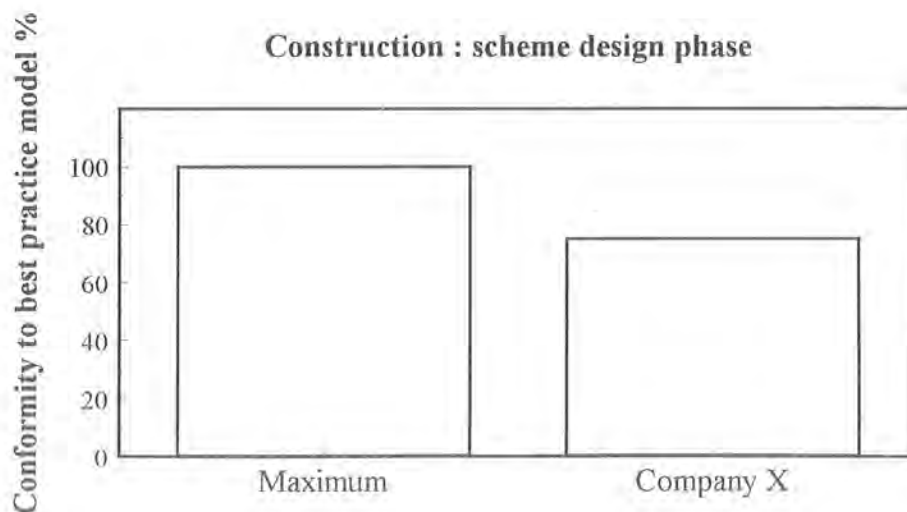
**Level 4** *Audited assessments of more than one company.* This will allow objective comparisons between companies but will produce process effectiveness and process efficiency measures applicable only to the participants.

**Level 5** *Audited assessments and comparison against a database developed from results of other members of a benchmarking club.* This will allow participants to compare themselves fully against all others in the club on a confidential basis.

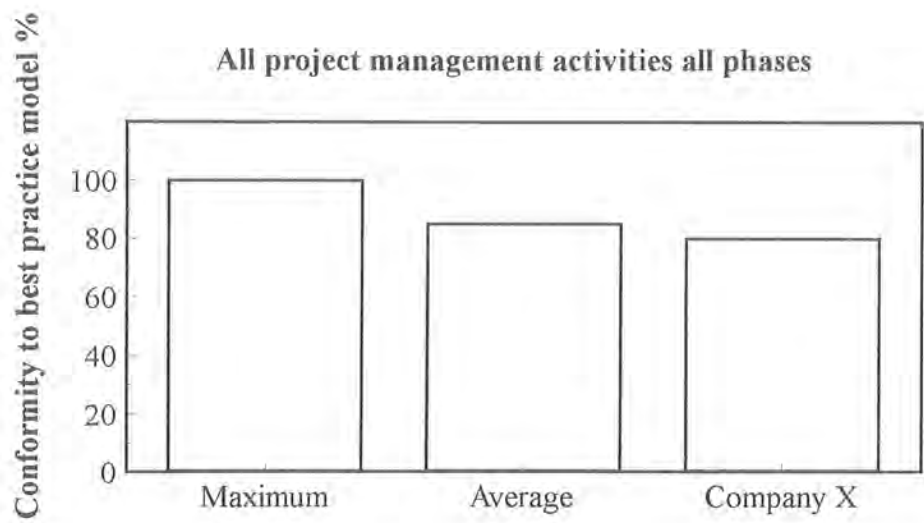
### Presentation of results

Results can be provided for the entire model, or for particular phases, processes or activities within it.

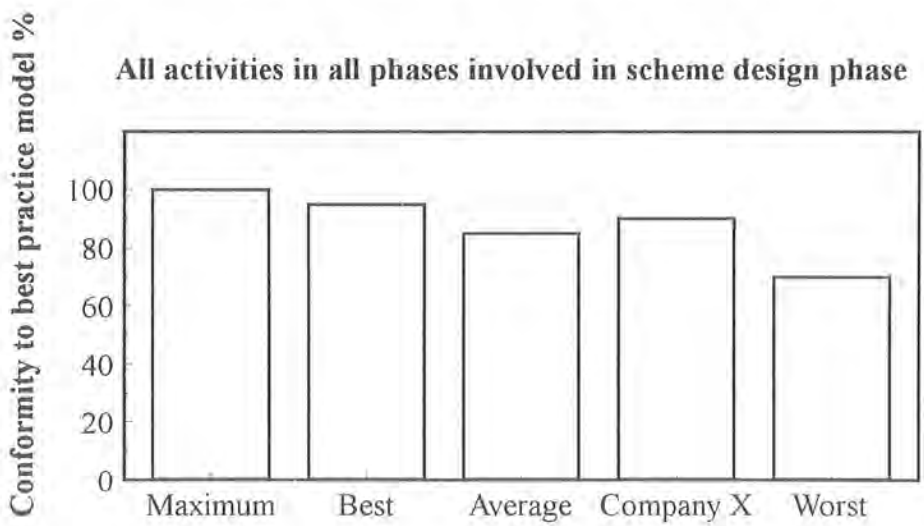
Level 1 and level 3 analyses would produce no more than the company's percentage compared to the maximum, the only difference being that the figure for level 3 would be audited and thus more objective (see below).



Level 2 and 4 analyses would produce the company's percentage compared to the maximum and the average, again the only difference being that the figure for level 4 would be audited and thus more objective (see below).



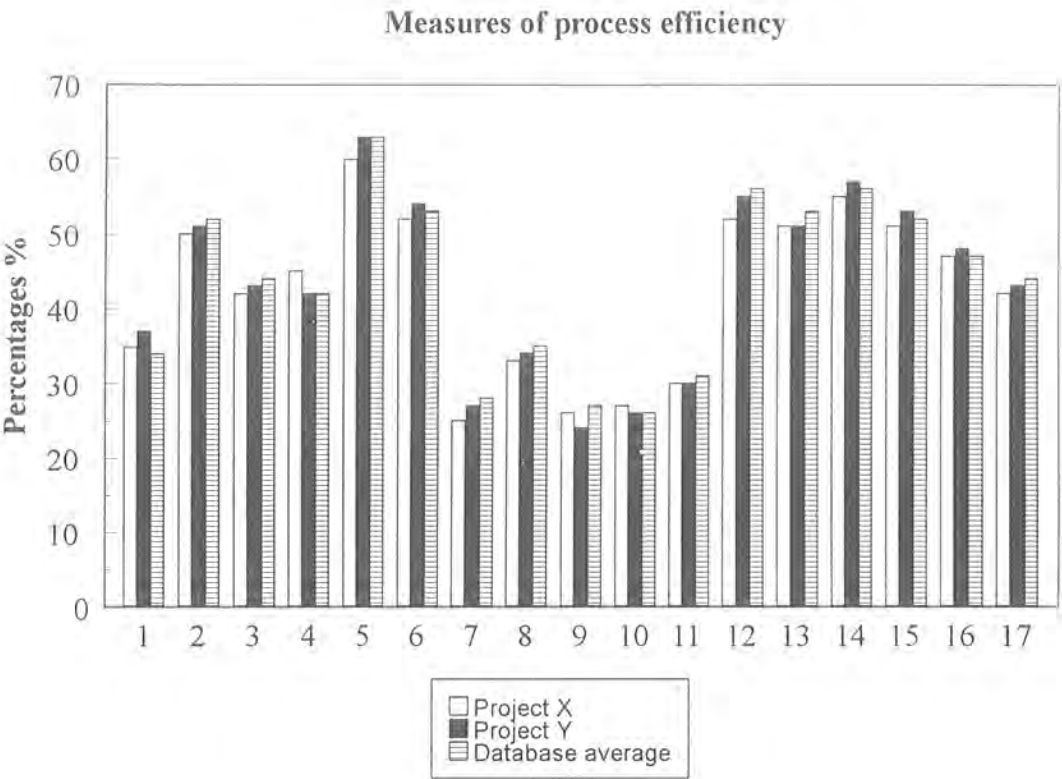
Level 5 analysis would produce the company's percentage compared to the maximum, the average, the best and the worst. All of these figures would have been audited and would therefore be objective. (see below)



**Process efficiency and effectiveness measures**

Process efficiency and process effectiveness measures relate to data that is obtained throughout the duration of the project, and steps need to be taken at the start of a project to collect the appropriate figures for later recording of these measures. These measures apply only to individual projects and are only relevant to levels 2, 4 and 5.

Process efficiency measures are all individual, and therefore can only be compared with similar items from another project. Collectively, they could be shown as a bar chart like that below.



The process effectiveness measures include questions that provide general information on the project for later use in analysis and which cannot be shown in graphical form. The answers will assist in interpretation and report writing for any of the benchmarking results. The remaining questions, again, are all individual and can only be compared with similar items from another project. Collectively they could also be shown as a bar chart.



## The way forward

### Use of the questionnaire

Having accepted that process benchmarking will assist the continuous improvement desired, companies in all sectors of the industry will benefit from the comprehensive understanding of their own processes that is required.

The questionnaire is applicable across all construction industry sectors involved in project activities although, of course, some companies will only be involved in certain phases or processes in any particular project. Any company wishing to benchmark may use the appropriate sections of the questionnaire but will need to decide which of the five levels of results that is appropriate to their needs.

**Level 1** may be carried out immediately on receipt of this book.

**Level 2** will require a benchmarking partner to be identified and a joint exercise agreed.

**Level 3** will need an independent auditor to be appointed.

**Level 4** will require both a benchmarking partner and an independent auditor.

**Level 5** will require the company to join, or establish with others, a benchmarking club which will then generate a database as well as arranging for independent audit.

### Use of the ECI benchmarking model to develop performance benchmarks

The model can be used to develop performance benchmarks by breaking down the activities involved in any process until the sub-activities are common and measurable across industry sectors. Examples might include activities involved in letting contracts and use of computer aided design.



*How much constructive use do you make of CAD?*

### **Benchmarking clubs**

Level 5 results are likely to be the most beneficial to any company contemplating process benchmarking. However, this will entail the setting up of a benchmarking club, membership of which could be open to any company in the construction industry.

The objective of a benchmarking club would be to enable members to compare the processes involved in their own project execution with those defined by the ECI benchmarking model and to measure the effectiveness and efficiency of those processes. As a result, members would be in a position to compare their projects systematically and confidentially with those of other members of the club. This would offer a powerful stimulus to continuous improvement of processes and practices throughout the industry.

A benchmarking club would need to operate under conditions of strict confidentiality to allow sharing of non-critical data amongst member companies whilst ensuring the anonymity of each (see Appendix J).

## **Appendix I. Glossary of terms**

This glossary defines terms used in the text of chapter 6 and in the questionnaire in Appendix K. In some cases, these are not the traditional definition but for the sake of consistency should be used for any benchmarking using this questionnaire.

|                                     |                                                                                                                                                                                                                                                                     |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>As-built documentation</b>       | Documentation provided by the contractor showing what has actually been constructed.                                                                                                                                                                                |
| <b>Assessment</b>                   | A broad, qualitative review of a number of scenarios or options.                                                                                                                                                                                                    |
| <b>Assumptions</b>                  | Provisional decisions made which will be need to be confirmed or amended later.                                                                                                                                                                                     |
| <b>Client</b>                       | The organisation for whom the development is intended and who enters into a contractual relationship with the contractor.                                                                                                                                           |
| <b>Commissioning and operations</b> | All activities involved in preparing for the operating phase of the development.                                                                                                                                                                                    |
| <b>Commissioning strategy</b>       | How the commissioning of the project will take place.                                                                                                                                                                                                               |
| <b>Construction</b>                 | All activities involved in the physical execution of the design on site.                                                                                                                                                                                            |
| <b>Contract documentation</b>       | Contractual documents against which a contractor can submit his tender to carry out the contract.                                                                                                                                                                   |
| <b>Contractor</b>                   | Any organisation that enters into a contractual relationship with the client to provide product or service as part of the construction process. Could be a single entity or a group of companies linked together through some form of partnership or joint venture. |
| <b>Decommissioning</b>              | The abandonment and removal of the structures at the end of the developments operational life.                                                                                                                                                                      |
| <b>Decommissioning strategy</b>     | The general principles of whether the development needs to be decommissioned when design life is complete and if so how it could best be done.                                                                                                                      |
| <b>Detail design</b>                | The final design of the project, incorporating the detailed engineering and all other preparations necessary for commencement on site.                                                                                                                              |

|                                          |                                                                                                                                                                                                                                                                             |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Development</b>                       | Overall scheme from feasibility through commissioning and operation to decommissioning.                                                                                                                                                                                     |
| <b>Development objectives</b>            | Statement defining the development's aims and their relationships to the corporate strategic plan.                                                                                                                                                                          |
| <b>Engineering</b>                       | All activities involved in the technical design of the project                                                                                                                                                                                                              |
| <b>Equipment</b>                         | Machinery, vessels and instrumentation that is produced to order.                                                                                                                                                                                                           |
| <b>Evaluation</b>                        | A detailed, quantitative review of scenarios or options.                                                                                                                                                                                                                    |
| <b>Feasibility design</b>                | The initial scheme concept that scopes the development, prepares the commercial case, identifies risks and defines the project implementation strategy.                                                                                                                     |
| <b>Governmental policy uncertainties</b> | Changes in policy within a stable political system having a major bearing on the project either directly or indirectly.                                                                                                                                                     |
| <b>HAZAN</b>                             | Hazard analysis, the identification of undesired events that lead to the materialisation of a hazard, the analysis of the mechanisms by which these undesired events could occur and usually the estimation of the extent, magnitude and likelihood of any harmful effects. |
| <b>HAZOP</b>                             | Hazard operability study in which a team of engineers systematically review engineering drawings by the application of guide-words to identify all deviations from design intent with undesirable effects for safety or operability.                                        |
| <b>Independent design review</b>         | An outline design check by an independent reviewer to certify conformance to specified requirements.                                                                                                                                                                        |
| <b>Key economic variables</b>            | Macro-economic factors such as changes in GDP and unemployment rates.                                                                                                                                                                                                       |
| <b>Key financial variables</b>           | Interest rates and exchange rates.                                                                                                                                                                                                                                          |
| <b>Materials</b>                         | Specified generic commodities.                                                                                                                                                                                                                                              |
| <b>Operational safety</b>                | Safety considerations during operating phase which are taken into account during all phases of the project.                                                                                                                                                                 |

|                                         |                                                                                                                                                                                                                  |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Partnering</b>                       | Contractual arrangements between a client and their chosen contractors, which promote co-operation between the parties.                                                                                          |
| <b>Period of validity</b>               | The time after which key design assumptions no longer apply.                                                                                                                                                     |
| <b>Planning supervisor</b>              | The person with overall responsibility for co-ordinating health and safety aspects of the design and planning phase and for the early stages of the health and safety site plan and the health and safety file.  |
| <b>Procurement</b>                      | All activities involved in assembling tender lists and contract documentation, obtaining bids and the management of the delivery of materials, equipment and services.                                           |
| <b>Project</b>                          | The physical structures needed for the development, the implementation of which can be divided into several phases - feasibility design, scheme design, detail design, site construction and site commissioning. |
| <b>Project management</b>               | All activities involved in establishing and administering the project objectives, including cost and schedule control.                                                                                           |
| <b>Project sponsor</b>                  | Member of client's staff with overall responsibility for delivery of the development.                                                                                                                            |
| <b>Regulatory compliance and safety</b> | All activities involved in meeting statutory requirements and ensuring that all safety and environmental considerations are taken into account.                                                                  |
| <b>Risk</b>                             | An assessment of the chances of a particular hazard occurring.                                                                                                                                                   |
| <b>Risk management and assumptions</b>  | All activities involved in identifying, assessing, quantifying and managing risks and identifying unknowns, principally site conditions, where assumptions have to be made.                                      |
| <b>Scheme design</b>                    | The confirmation that the project is technically and economically feasible and the establishment of the project implementation strategy.                                                                         |

|                                  |                                                                                                                                                                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site commissioning</b>        | Operational trials proving that the design and specification meet the development objectives.                                                                            |
| <b>Site construction</b>         | All site work needed to implement the design to meet the specification.                                                                                                  |
| <b>Site operations</b>           | The early stage of operation of the development during which some minor outstanding project activities are completed.                                                    |
| <b>Strategic political risks</b> | Major civil unrest, war, major change in type of regime leading on to such measures as nationalisation or abandonment.                                                   |
| <b>Technical specifications</b>  | Specifications of the project requirements, which will vary according to the type of development and in particular the type of specialised equipment to be incorporated. |

## **Appendix J.      Benchmarking code of conduct**

This code of conduct was developed by the International Benchmarking Clearing House and the Strategic Planning Institute, Cambridge, Massachusetts, USA, and distributed by the DTI as part of its Benchmarking Challenge of 1993.

### **Keep it legal**

When benchmarking with competitors, avoid topics that even remotely resemble anti-restrictive trade practice issues. Get your legal team involved in benchmarking plans.

### **Understand expectations and act in accordance with them**

Determining what sort of information will be exchanged and how it will be communicated means that there will not be any nasty surprises down the road.

### **Be willing to give what you get**

Be prepared to provide the same level of information you request.

### **Respect confidentiality**

Do not communicate benchmarking information to other companies without the permission of the other participating companies

### **Use only designated benchmarking contacts**

Restrict benchmarking discussion to designated contacts. Also, obtain individual's permission before using their name in response to another organisation's request.

### **Be prepared from the start**

Lack of proper presentation wastes everyone's time.





## **Appendix K.     Benchmarking questionnaire**

### **Guide to completion**

This questionnaire consists of three sections, covering measures of process effectiveness, process conformity to a high-level model of best practice and process efficiency. Ideally all three should be completed for any one project being benchmarked, but it is recognised that data for the measures of process efficiency and effectiveness needs to be collected from the start of the project, and therefore projects that are already under way will not be able to establish all of the measures of efficiency and effectiveness.

The questionnaire is generic, but some questions may not be applicable to all aspects of a particular project being worked on by a company. In such cases, a 'nil' response to a particular question should be provided.

Where multiple choices are given, circle one (A, B, C or D) only.

## Section 1 Measures of process effectiveness

General description of the project and your company's part in it

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1. How would you rate the complexity of the project?

|                |       |
|----------------|-------|
| Simple         | _____ |
| Fairly complex | _____ |
| Complex        | _____ |
| Very complex   | _____ |

2. Was this project considered of high strategic importance priority? Yes No

3. Did the project cause any delay to other projects? Yes No

4. What was the final installed value of the total project? \_\_\_\_\_

Percentage design and engineering \_\_\_\_\_

Percentage materials \_\_\_\_\_

Percentage construction \_\_\_\_\_

5. What percentage was your company's part of the project? \_\_\_\_\_

*Questions 6 to 12 for clients only.*

6. Was the project completed within the budget established at the end of scheme design including contingencies? Yes No

7. If not, what was the percentage overrun? \_\_\_\_\_

8. What percentage of the final project cost was due to variations? \_\_\_\_\_

Percentage due to client changes \_\_\_\_\_

Percentage due to changes resulting from site conditions \_\_\_\_\_

Percentage due to changes resulting from commissioning \_\_\_\_\_

9. What was the duration (in months) of the overall project from end of scheme design to end of commissioning? \_\_\_\_\_

10. Was the overall project completed within the programme established at the end of scheme design? Yes No

11. If not, what was the percentage overrun? \_\_\_\_\_

12. What was the principal reason for any overrun? (tick one only)

Operational constraints \_\_\_\_\_  
 Materials constraints \_\_\_\_\_  
 Resource constraints \_\_\_\_\_

*Questions 13 to 19 for contractors only.*

13. Was your contract completed within contractual budget plus variations? Yes No

14. If not, what was the percentage overrun? \_\_\_\_\_

15. What percentage of your final contractual cost was due to variations? \_\_\_\_\_

Percentage due to client changes \_\_\_\_\_  
 Percentage due to changes resulting from site conditions \_\_\_\_\_  
 Percentage due to changes resulting from commissioning \_\_\_\_\_

16. What was the duration (in months) of your company's contractual programme? \_\_\_\_\_

17. Was the project completed within the contractual programme? Yes No

18. If not, what was the percentage overrun? \_\_\_\_\_

19. What was the principal reason for any overrun? (tick one only) \_\_\_\_\_

Operational constraints \_\_\_\_\_  
 Materials constraints \_\_\_\_\_  
 Resource constraints \_\_\_\_\_

20. What was the settlement value of claims (percentage) compared to original contract value? (Claims are defined as disputed demands formally submitted in writing) \_\_\_\_\_

21. Fatal and non-fatal accidents during whole project

Total work hours (W) \_\_\_\_\_  
 Fatalities \_\_\_\_\_  
 Lost time injuries (LTI) \_\_\_\_\_  
 Lost time frequency (LTI x 200,000 / W) \_\_\_\_\_  
 Days lost (DL) \_\_\_\_\_  
 Severity frequency (DL x 200,000 / W) \_\_\_\_\_

22. What was the value of rework (percentage) due to defective work during construction phase per completed project costs? \_\_\_\_\_

23. What was the value of defective and unfinished work (percentage) at completion of construction phase per completed project costs? \_\_\_\_\_

## Section 2    Process Conformity

This section of the questionnaire concerns the ECI benchmarking model (page 247) where a project is split into phases, with common activities running through all the phases. The matrix below shows how the question numbers relate to the project phases and activities.

| Project activities \ Project Phases | Feasibility design | Scheme design | Detail design | Site construction | Site commissioning | Site operations |
|-------------------------------------|--------------------|---------------|---------------|-------------------|--------------------|-----------------|
| Project management                  | 1.1                | 1.2           | 1.3           | 1.4               | 1.5                | 1.6             |
| Engineering                         | 2.1                | 2.2           | 2.3           | 2.4               | 2.5                | 2.6             |
| Regulatory compliance and safety    | 3.1                | 3.2           | 3.3           | 3.4               | 3.5                | 3.6             |
| Risk management and assumptions     | 4.1                | 4.2           | 4.3           | 4.4               | 4.5                | 4.6             |
| Procurement                         | 5.1                | 5.2           | 5.3           | 5.4               | 5.5                | 5.6             |
| Construction                        | 6.1                | 6.2           | 6.3           | 6.4               | 6.5                | 6.6             |
| Commissioning and operations        | 7.1                | 7.2           | 7.3           | 7.4               | 7.5                | 7.6             |

Circle one only (A, B, C or D) for each question.

- A = Fully conforms to current practice for project being benchmarked
- B = Mostly conforms to current practice for project being benchmarked
- C = Partly conforms to current practice for project being benchmarked
- D = Does not conform to current practice for project being benchmarked

|             |                                                                                                                                                  |   |   |   |   |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| <b>1.</b>   | <b>Project management</b>                                                                                                                        |   |   |   |   |
| <b>1.1.</b> | <b>Feasibility design</b>                                                                                                                        |   |   |   |   |
|             | <b>Development objectives</b>                                                                                                                    |   |   |   |   |
| 1.1.1.      | Development objectives will be stated.                                                                                                           | A | B | C | D |
| 1.1.2.      | Company strategic business objectives will be available.                                                                                         | A | B | C | D |
| 1.1.3.      | A systematic assessment of how the development objectives meet the stated company strategic business objectives will be carried out.             | A | B | C | D |
| 1.1.4.      | A systematic market assessment for the development will be carried out.                                                                          | A | B | C | D |
|             | <b>Development programme</b>                                                                                                                     |   |   |   |   |
| 1.1.5.      | An outline programme for the development will be established.                                                                                    | A | B | C | D |
|             | <b>Development finance</b>                                                                                                                       |   |   |   |   |
| 1.1.6.      | A cost estimate for the development will be prepared.                                                                                            | A | B | C | D |
| 1.1.7.      | A systematic assessment of options for development financing will be carried out.                                                                | A | B | C | D |
| 1.1.8.      | A systematic cost/benefit analysis will be carried out.                                                                                          | A | B | C | D |
|             | <b>Project administration</b>                                                                                                                    |   |   |   |   |
| 1.1.9.      | The project sponsor will be appointed.                                                                                                           | A | B | C | D |
| 1.1.10.     | A systematic assessment of in-house capability for project implementation will be carried out.                                                   | A | B | C | D |
| 1.1.11.     | A budget will be set for feasibility phase activities.                                                                                           | A | B | C | D |
| 1.1.12.     | A systematic monitoring of costs and schedule for the feasibility phase will be carried out.                                                     | A | B | C | D |
| 1.1.13.     | A budget for the next phase will be estimated.                                                                                                   | A | B | C | D |
| 1.1.14.     | A formal, regular reporting system for all main project activities will be established.                                                          | A | B | C | D |
| 1.1.15.     | A recommendation for the next phase will be prepared.                                                                                            | A | B | C | D |
| <b>1.2.</b> | <b>Scheme design</b>                                                                                                                             |   |   |   |   |
|             | <b>Development objectives</b>                                                                                                                    |   |   |   |   |
| 1.2.1.      | A systematic review will be carried out to establish that the updated development continues to meet the company's strategic business objectives. | A | B | C | D |
|             | <b>Development programme</b>                                                                                                                     |   |   |   |   |
| 1.2.2.      | The detailed programme for the development will be updated.                                                                                      | A | B | C | D |
| 1.2.3.      | The detailed programme for the project will be prepared.                                                                                         | A | B | C | D |
|             | <b>Development finance</b>                                                                                                                       |   |   |   |   |
| 1.2.4.      | A project cost estimate will be prepared.                                                                                                        | A | B | C | D |
| 1.2.5.      | Operations and maintenance cost estimates will be prepared.                                                                                      | A | B | C | D |
| 1.2.6.      | Any differences from earlier estimates will be explained.                                                                                        | A | B | C | D |
| 1.2.7.      | A systematic updating of options for project financing will be carried out.                                                                      | A | B | C | D |
| 1.2.8.      | A systematic updating of the cost/benefit analysis will be carried out.                                                                          | A | B | C | D |

|                               |                                                                                                        |         |
|-------------------------------|--------------------------------------------------------------------------------------------------------|---------|
| <b>Project administration</b> |                                                                                                        |         |
| 1.2.9.                        | The project manager will be appointed.                                                                 | A B C D |
| 1.2.10.                       | The planning supervisor will be appointed.                                                             | A B C D |
| 1.2.11.                       | Team building exercises will be conducted.                                                             | A B C D |
| 1.2.12.                       | A systematic monitoring of costs and schedule for the scheme design phase will be carried out.         | A B C D |
| 1.2.13.                       | A budget for the next phase will be estimated.                                                         | A B C D |
| 1.2.14.                       | A formal, regular reporting system for all main project activities will be maintained.                 | A B C D |
| 1.2.15.                       | A recommendation for the next phase taking into account assessed risks and estimates will be prepared. | A B C D |
| <br>                          |                                                                                                        |         |
| <b>1.3.</b>                   | <b>Detail design</b>                                                                                   |         |
|                               | <b>Development objectives</b> No specific activities under this phase.                                 |         |
| <br>                          |                                                                                                        |         |
| <b>Development programme</b>  |                                                                                                        |         |
| 1.3.1.                        | The detailed programme for the project will be updated.                                                | A B C D |
| 1.3.2.                        | The detailed programme for the development will be updated.                                            | A B C D |
| <br>                          |                                                                                                        |         |
| <b>Development finance</b>    |                                                                                                        |         |
| 1.3.3.                        | Project cost estimates will be continually updated.                                                    | A B C D |
| 1.3.4.                        | Operations and maintenance cost estimates will be continually updated.                                 | A B C D |
| 1.3.5.                        | Any differences from earlier estimates will be explained.                                              | A B C D |
| <br>                          |                                                                                                        |         |
| <b>Project administration</b> |                                                                                                        |         |
| 1.3.6.                        | Team building exercises will be conducted.                                                             | A B C D |
| 1.3.7.                        | A systematic monitoring of costs and schedule for the detail design phase will be carried out.         | A B C D |
| 1.3.8.                        | A budget for the next phase will be estimated.                                                         | A B C D |
| 1.3.9.                        | A recommendation for the next phase will be prepared taking into account assessed risks and estimates. | A B C D |
| 1.3.10.                       | All assumptions made in the design will be stated.                                                     | A B C D |
| 1.3.11.                       | A formal, regular reporting system for all main project activities will be maintained.                 | A B C D |
| <br>                          |                                                                                                        |         |
| <b>1.4.</b>                   | <b>Site construction</b>                                                                               |         |
|                               | <b>Development objectives</b> No specific activities under this phase.                                 |         |
| <br>                          |                                                                                                        |         |
| <b>Development programme</b>  |                                                                                                        |         |
| 1.4.1.                        | The detailed programme for the project will be updated.                                                | A B C D |
| 1.4.2.                        | The detailed programme for the development will be updated.                                            | A B C D |
| <br>                          |                                                                                                        |         |
| <b>Development finance</b>    |                                                                                                        |         |
| 1.4.3.                        | The project cost estimates will be continually updated.                                                | A B C D |
| 1.4.4.                        | The operations and maintenance cost estimates will be continually updated.                             | A B C D |
| 1.4.5.                        | Any differences from earlier estimates will be explained.                                              | A B C D |

|                               |                                                                                                     |         |
|-------------------------------|-----------------------------------------------------------------------------------------------------|---------|
| <b>Project administration</b> |                                                                                                     |         |
| 1.4.6.                        | Team building exercises will be conducted.                                                          | A B C D |
| 1.4.7.                        | A systematic monitoring of costs and schedule for the site construction phase will be carried out.  | A B C D |
| 1.4.8.                        | A budget for the next phase will be estimated.                                                      | A B C D |
| 1.4.9.                        | A formal, regular reporting system for all main project activities will be maintained.              | A B C D |
| <b>1.5.</b>                   | <b>Site commissioning</b>                                                                           |         |
|                               | <b>Development objectives</b> No specific activities under this phase.                              |         |
|                               | <b>Development programme</b> No specific activities under this phase.                               |         |
| <b>Development finance</b>    |                                                                                                     |         |
| 1.5.1.                        | Project cost estimates will be continually updated.                                                 | A B C D |
| 1.5.2.                        | Operations and maintenance cost estimates will be continually updated.                              | A B C D |
| 1.5.3.                        | Any differences from earlier estimates will be explained.                                           | A B C D |
| <b>Project administration</b> |                                                                                                     |         |
| 1.5.4.                        | Team building exercises will be conducted.                                                          | A B C D |
| 1.5.5.                        | A systematic monitoring of costs and schedule for the site commissioning phase will be carried out. | A B C D |
| 1.5.6.                        | A formal, regular reporting system for all main project activities will be maintained.              | A B C D |
| <b>1.6.</b>                   | <b>Site operations</b>                                                                              |         |
|                               | <b>Development objectives</b> No specific activities under this phase.                              |         |
|                               | <b>Development programme</b> No specific activities under this phase.                               |         |
| <b>Development finance</b>    |                                                                                                     |         |
| 1.6.1.                        | The final project cost will be established.                                                         | A B C D |
| 1.6.2.                        | Operations and maintenance cost estimates will be continually updated.                              | A B C D |
| 1.6.3.                        | Any differences from earlier estimates will be explained.                                           | A B C D |
| <b>Project administration</b> |                                                                                                     |         |
| 1.6.4.                        | A detailed close-out report will be produced.                                                       | A B C D |
| 1.6.5.                        | A post-project audit will be conducted for significant projects.                                    | A B C D |
| 1.6.6.                        | Lessons learned will be systematically distributed for future project use.                          | A B C D |



## 2. Engineering

### 2.1. Feasibility design

- |        |                                                                                                        |   |   |   |   |
|--------|--------------------------------------------------------------------------------------------------------|---|---|---|---|
| 2.1.1. | A systematic assessment of alternative solutions to meet the business requirement will be carried out. | A | B | C | D |
| 2.1.2. | A systematic assessment of alternative site options will be carried out.                               | A | B | C | D |
| 2.1.3. | A systematic assessment of geotechnical factors affecting site location will be carried out.           | A | B | C | D |
| 2.1.4. | A systematic assessment of materials requirements will be carried out.                                 | A | B | C | D |
| 2.1.5. | A systematic assessment of whether new technology is required.                                         | A | B | C | D |
| 2.1.6. | A systematic assessment of whether unusual use of existing technology is required will be carried out. | A | B | C | D |
| 2.1.7. | A systematic assessment of patent issues will be carried out.                                          | A | B | C | D |

### 2.2. Scheme design

- |        |                                                                                                 |   |   |   |   |
|--------|-------------------------------------------------------------------------------------------------|---|---|---|---|
| 2.2.1. | A systematic evaluation of alternative solutions the business requirement will be carried out.  | A | B | C | D |
| 2.2.2. | A systematic evaluation of alternative site options will be carried out.                        | A | B | C | D |
| 2.2.3. | A systematic evaluation of geotechnical factors affecting site location will be carried out.    | A | B | C | D |
| 2.2.4. | A systematic evaluation of materials requirements will be carried out.                          | A | B | C | D |
| 2.2.5. | A systematic evaluation of any new technology required will be carried out.                     | A | B | C | D |
| 2.2.6. | A systematic evaluation of any unusual use of existing technology required will be carried out. | A | B | C | D |
| 2.2.7. | A systematic evaluation of patent issues will be carried out.                                   | A | B | C | D |
| 2.2.8. | Outline technical specifications will be prepared.                                              | A | B | C | D |
| 2.2.9. | A preliminary site layout will be prepared.                                                     | A | B | C | D |

### 2.3. Detail design

- |        |                                                                                                 |   |   |   |   |
|--------|-------------------------------------------------------------------------------------------------|---|---|---|---|
| 2.3.1. | An assessment will be made of the need for independent design reviews.                          | A | B | C | D |
| 2.3.2. | Detailed technical specifications for services, equipment and materials will be prepared.       | A | B | C | D |
| 2.3.3. | An assessment will be made of interdependence with other projects.                              | A | B | C | D |
| 2.3.4. | An assessment will be made of the availability of services or support from existing facilities. | A | B | C | D |
| 2.3.5. | Schedules for equipment and materials will be prepared.                                         | A | B | C | D |
| 2.3.6. | A detailed site layout will be prepared.                                                        | A | B | C | D |

### 2.4. Site construction

- |        |                                                                                                         |   |   |   |   |
|--------|---------------------------------------------------------------------------------------------------------|---|---|---|---|
| 2.4.1. | A systematic method for dealing with changes originating with the client will be established.           | A | B | C | D |
| 2.4.2. | A systematic method for dealing with changes resulting from actual site conditions will be established. | A | B | C | D |



|             |                                                                                                                         |                                          |
|-------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>2.5.</b> | <b>Site commissioning</b>                                                                                               |                                          |
| 2.5.1       | A systematic method for dealing with changes resulting from commissioning experience will be established.               | A B C D                                  |
| <b>2.6.</b> | <b>Site operations</b>                                                                                                  | No specific activities under this phase. |
| <b>3.</b>   | <b>Regulatory compliance and safety</b>                                                                                 |                                          |
| <b>3.1.</b> | <b>Feasibility design</b>                                                                                               |                                          |
| 3.1.1.      | A HAZOP will be carried out to establish whether the development objectives can be safely met.                          | A B C D                                  |
| 3.1.2.      | There will be a systematic identification of environmental risks.                                                       | A B C D                                  |
| 3.1.3.      | There will be a systematic identification of potentially contentious social issues.                                     | A B C D                                  |
| 3.1.4.      | There will be a systematic identification of baseline environmental data requirements.                                  | A B C D                                  |
| 3.1.5.      | There will be a systematic identification of all regulatory and planning requirements.                                  | A B C D                                  |
| 3.1.6.      | There will be a systematic identification of any wayleave requirements.                                                 | A B C D                                  |
| <b>3.2.</b> | <b>Scheme design</b>                                                                                                    |                                          |
| 3.2.1.      | A HAZAN will be carried out to confirm that the development objectives can be safely met.                               | A B C D                                  |
| 3.2.2.      | A site safety strategy will be produced.                                                                                | A B C D                                  |
| 3.2.3.      | A systematic evaluation of environmental impact will be carried out.                                                    | A B C D                                  |
| 3.2.4.      | A systematic evaluation of potentially contentious social issues will be carried out.                                   | A B C D                                  |
| 3.2.5.      | There will be a systematic collection of baseline environmental data.                                                   | A B C D                                  |
| 3.2.6.      | There will be a continuing evaluation of the scheme design against baseline environmental data.                         | A B C D                                  |
| 3.2.7.      | There will be a systematic evaluation of all regulatory and planning requirements.                                      | A B C D                                  |
| 3.2.8.      | Required statutory consents for this stage will be obtained.                                                            | A B C D                                  |
| 3.2.9.      | There will be a systematic evaluation of any wayleave requirements.                                                     | A B C D                                  |
| <b>3.3.</b> | <b>Detail design</b>                                                                                                    |                                          |
| 3.3.1.      | The HAZAN will be systematically updated.                                                                               | A B C D                                  |
| 3.3.2.      | A site safety plan will be produced.                                                                                    | A B C D                                  |
| 3.3.3.      | There will be a systematic updating of any assessment of environmental impact.                                          | A B C D                                  |
| 3.3.4.      | A public relations policy and plan to meet the evaluation of potentially contentious social issues will be established. | A B C D                                  |
| 3.3.5.      | Collection of baseline environmental data will continue.                                                                | A B C D                                  |
| 3.3.6.      | There will be a continuing evaluation of the detail design against baseline environmental data.                         | A B C D                                  |

|             |                                                                                                                                           |   |   |   |   |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 3.3.7.      | A systematic review to determine whether the detail design takes account of all regulatory and planning requirements will be carried out. | A | B | C | D |
| 3.3.8.      | Required statutory consents for this stage will be obtained.                                                                              | A | B | C | D |
| 3.3.9.      | Any wayleave requirements will be obtained.                                                                                               | A | B | C | D |
| <b>3.4.</b> | <b>Site construction</b>                                                                                                                  |   |   |   |   |
| 3.4.1.      | The HAZAN will be systematically updated.                                                                                                 | A | B | C | D |
| 3.4.2.      | The site safety record will be monitored against the site safety plan.                                                                    | A | B | C | D |
| 3.4.3.      | There will be a continuing updating of any assessment of environmental impact.                                                            | A | B | C | D |
| 3.4.4.      | Public reaction will be monitored against the public relations plan.                                                                      | A | B | C | D |
| 3.4.5.      | Collection of baseline environmental data will continue.                                                                                  | A | B | C | D |
| 3.4.6.      | There will be a continuing evaluation of site construction activity against baseline environmental data.                                  | A | B | C | D |
| 3.4.7.      | There will be a continuing review to determine whether the construction activities meet all regulatory and planning requirements.         | A | B | C | D |
| 3.4.8.      | Required statutory consents for this stage will be obtained.                                                                              | A | B | C | D |
| <b>3.5.</b> | <b>Site commissioning</b>                                                                                                                 |   |   |   |   |
| 3.5.1.      | The operational safety plan will be established.                                                                                          | A | B | C | D |
| 3.5.2.      | Collection of baseline environmental data will be updated to incorporate operational activities.                                          | A | B | C | D |
| 3.5.3.      | There will be a continuing updating of any assessment of environmental impact.                                                            | A | B | C | D |
| 3.5.4.      | Public reaction will be monitored against the public relations plan.                                                                      | A | B | C | D |
| 3.5.5.      | There will be a continuing review to determine whether the operational activities meet all regulatory and planning requirements.          | A | B | C | D |
| 3.5.6.      | Required statutory consents for this stage will be obtained.                                                                              | A | B | C | D |
| <b>3.6.</b> | <b>Site operations</b>                                                                                                                    |   |   |   |   |
| 3.6.1.      | There will be a systematic monitoring against the operational safety plan.                                                                | A | B | C | D |
| 3.6.2.      | Collection of baseline environmental data will be updated to incorporate operational activities.                                          | A | B | C | D |
| 3.6.3.      | There will be a continuing updating of any assessment of environmental impact.                                                            | A | B | C | D |
| 3.6.4.      | Public reaction will be monitored against the public relations plan.                                                                      | A | B | C | D |
| 3.6.5.      | There will be a continuing review to determine whether the operational activities meet all regulatory and planning requirements.          | A | B | C | D |
| 3.6.6.      | Required statutory consents for this stage will be obtained.                                                                              | A | B | C | D |

## **4. Risk management and assumptions**

### **4.1. Feasibility design**

- |         |                                                                                                                |   |   |   |   |
|---------|----------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 4.1.1.  | There will be a systematic identification of interdependence with other projects.                              | A | B | C | D |
| 4.1.2.  | There will be a systematic identification of the availability of services or support from existing facilities. | A | B | C | D |
| 4.1.3.  | There will be a systematic identification of climatic risks.                                                   | A | B | C | D |
| 4.1.4.  | There will be a systematic identification of seismic risks.                                                    | A | B | C | D |
| 4.1.5.  | There will be a systematic identification of strategic political risks.                                        | A | B | C | D |
| 4.1.6.  | There will be a systematic identification of commercial risks.                                                 | A | B | C | D |
| 4.1.7.  | There will be a systematic identification of key governmental policy uncertainties.                            | A | B | C | D |
| 4.1.8.  | There will be a systematic identification of key economic variables.                                           | A | B | C | D |
| 4.1.9.  | There will be a systematic identification of key financial variables.                                          | A | B | C | D |
| 4.1.10. | There will be a systematic identification of financial stability of likely partners and contractors.           | A | B | C | D |
| 4.1.11. | Key assumptions in the design will be stated.                                                                  | A | B | C | D |
| 4.1.12. | The period of validity of the feasibility design will be stated.                                               | A | B | C | D |

### **4.2. Scheme design**

- |         |                                                                                                       |   |   |   |   |
|---------|-------------------------------------------------------------------------------------------------------|---|---|---|---|
| 4.2.1.  | There will be a systematic review of interdependence with other projects.                             | A | B | C | D |
| 4.2.2.  | There will be a systematic review of the availability of service or support from existing facilities. | A | B | C | D |
| 4.2.3.  | There will be a systematic evaluation of climatic risks.                                              | A | B | C | D |
| 4.2.4.  | There will be a systematic evaluation of seismic risks.                                               | A | B | C | D |
| 4.2.5.  | There will be a systematic evaluation of strategic political risks.                                   | A | B | C | D |
| 4.2.6.  | There will be a systematic evaluation of commercial risks.                                            | A | B | C | D |
| 4.2.7.  | There will be a systematic evaluation of key governmental policy uncertainties.                       | A | B | C | D |
| 4.2.8.  | There will be a systematic evaluation of key economic variables.                                      | A | B | C | D |
| 4.2.9.  | There will be a systematic evaluation of key financial variables.                                     | A | B | C | D |
| 4.2.10. | There will be a systematic evaluation of financial stability of likely partners and contractors.      | A | B | C | D |
| 4.2.11. | Key assumptions in the design will be updated.                                                        | A | B | C | D |
| 4.2.12. | The period of validity of the scheme design will be stated.                                           | A | B | C | D |

### **4.3. Detail design**

- |        |                                                             |   |   |   |   |
|--------|-------------------------------------------------------------|---|---|---|---|
| 4.3.1. | Key assumptions will continue to be updated.                | A | B | C | D |
| 4.3.2. | The period of validity of the detail design will be stated. | A | B | C | D |

### **4.4. Site construction**

- |        |                                      |   |   |   |   |
|--------|--------------------------------------|---|---|---|---|
| 4.4.1. | Key assumptions made will monitored. | A | B | C | D |
|--------|--------------------------------------|---|---|---|---|

|             |                                                                                                                          |         |
|-------------|--------------------------------------------------------------------------------------------------------------------------|---------|
| <b>4.5.</b> | <b>Site commissioning</b>                                                                                                |         |
| 4.5.1.      | Key assumptions made will monitored.                                                                                     | A B C D |
| <b>4.6.</b> | <b>Site operations</b> No specific activities under this phase.                                                          |         |
| <b>5.</b>   | <b>Procurement</b>                                                                                                       |         |
| <b>5.1.</b> | <b>Feasibility design</b>                                                                                                |         |
| 5.1.1.      | There will be a systematic assessment made of the benefits of partnering.                                                | A B C D |
| 5.1.2.      | There will be a systematic assessment of options for type of contract.                                                   | A B C D |
| 5.1.3.      | There will be a systematic assessment of procurement strategy.                                                           | A B C D |
| 5.1.4.      | Requirements for pre-commitment on contracts will be established.                                                        | A B C D |
| 5.1.5.      | There will be a systematic evaluation of financial stability of likely partners and contractors.                         | A B C D |
| 5.1.6.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.1.7.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.1.8.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.1.9.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |
| 5.1.10.     | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.1.11.     | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |
| 5.1.12.     | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |
| <b>5.2.</b> | <b>Scheme design</b>                                                                                                     |         |
| 5.2.1.      | There will be a systematic assessment made of the benefits of partnering.                                                | A B C D |
| 5.2.2.      | There will be a systematic assessment of options for type of contract.                                                   | A B C D |
| 5.2.3.      | Requirements for pre-commitment on contracts will be established.                                                        | A B C D |
| 5.2.4.      | There will be a systematic evaluation of financial stability of likely partners and contractors.                         | A B C D |
| 5.2.5.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.2.6.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.2.7.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.2.8.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |

|             |                                                                                                                          |         |
|-------------|--------------------------------------------------------------------------------------------------------------------------|---------|
| 5.2.9.      | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.2.10.     | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |
| 5.2.11.     | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |
| <b>5.3.</b> | <b>Detail design</b>                                                                                                     |         |
| 5.3.1.      | There will be a systematic assessment made of the benefits of partnering.                                                | A B C D |
| 5.3.2.      | There will be a systematic assessment of options for type of contract.                                                   | A B C D |
| 5.3.3.      | Requirements for pre-commitment on contracts will be established.                                                        | A B C D |
| 5.3.4.      | There will be a systematic evaluation of financial stability of likely partners and contractors.                         | A B C D |
| 5.3.5.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.3.6.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.3.7.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.3.8.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |
| 5.3.9.      | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.3.10.     | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |
| 5.3.11.     | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |
| <b>5.4.</b> | <b>Site construction</b>                                                                                                 |         |
| 5.4.1.      | There will be a systematic assessment made of the benefits of partnering.                                                | A B C D |
| 5.4.2.      | There will be a systematic assessment of options for type of contract.                                                   | A B C D |
| 5.4.3.      | There will be a systematic evaluation of financial stability of likely partners and contractors.                         | A B C D |
| 5.4.4.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.4.5.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.4.6.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.4.7.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |
| 5.4.8.      | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.4.9.      | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |



|             |                                                                                                                          |         |
|-------------|--------------------------------------------------------------------------------------------------------------------------|---------|
| 5.4.10.     | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |
| <b>5.5.</b> | <b>Site commissioning</b>                                                                                                |         |
| 5.5.1.      | There will be a systematic assessment of options for type of contract.                                                   | A B C D |
| 5.5.2.      | There will be a systematic evaluation of financial stability of likely contractors.                                      | A B C D |
| 5.5.3.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.5.4.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.5.5.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.5.6.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |
| 5.5.7.      | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.5.8.      | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |
| 5.5.9.      | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |
| <b>5.6.</b> | <b>Site operations</b>                                                                                                   |         |
| 5.6.1.      | Requirements for contracts to be let at this phase will be established.                                                  | A B C D |
| 5.6.2.      | For contracts to be let at this phase, technical specifications will be prepared.                                        | A B C D |
| 5.6.3.      | For contracts to be let at this phase, requisitions will be prepared.                                                    | A B C D |
| 5.6.4.      | For contracts to be let at this phase, there will be a systematic assessment of contractors leading to prequalification. | A B C D |
| 5.6.5.      | For contracts to be let at this phase, contract documentation will be prepared.                                          | A B C D |
| 5.6.6.      | For contracts to be let at this phase, there will be a systematic method for evaluating tenders.                         | A B C D |
| 5.6.7.      | For contracts to be let at this phase, there will be a systematic assessment of the need for expediting and inspection.  | A B C D |

## 6. Construction

### 6.1. Feasibility design

- |        |                                                                                                                                    |   |   |   |   |
|--------|------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.1.1. | There will be a systematic assessment of whether special construction plant is required.                                           | A | B | C | D |
| 6.1.2. | There will be a systematic assessment of special personnel skills required for construction.                                       | A | B | C | D |
| 6.1.3. | There will be a systematic assessment of constructability.                                                                         | A | B | C | D |
| 6.1.4. | There will be a systematic assessment of the effect of construction activities on neighbouring or other interdependent facilities. | A | B | C | D |

### 6.2. Scheme design

- |        |                                                                                                                                |   |   |   |   |
|--------|--------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.2.1. | There will be a systematic evaluation of what special construction plant is required.                                          | A | B | C | D |
| 6.2.2. | There will be a systematic evaluation of special personnel skills required for construction.                                   | A | B | C | D |
| 6.2.3. | There will be a continuing review of constructability.                                                                         | A | B | C | D |
| 6.2.4. | There will be a continuing review of the effect of construction activities on neighbouring or other interdependent facilities. | A | B | C | D |
| 6.2.5. | The outline construction implementation strategy will be prepared.                                                             | A | B | C | D |

### 6.3. Detail design

- |        |                                                                                                                                |   |   |   |   |
|--------|--------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.3.1. | There will be a continuing review of constructability.                                                                         | A | B | C | D |
| 6.3.2. | There will be a continuing review of the effect of construction activities on neighbouring or other interdependent facilities. | A | B | C | D |
| 6.3.3. | The detailed construction implementation plan will be prepared.                                                                | A | B | C | D |

### 6.4. Site construction

- |        |                                                                                                                                |   |   |   |   |
|--------|--------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.4.1. | There will be a continuing review of the effect of construction activities on neighbouring or other interdependent facilities. | A | B | C | D |
| 6.4.2. | As-built documentation of key areas will be prepared.                                                                          | A | B | C | D |
| 6.4.3. | There will be a systematic method for identifying and recording defective and unfinished work.                                 | A | B | C | D |

### 6.5. Site commissioning

- |        |                                                                                                |   |   |   |   |
|--------|------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.5.1. | There will be a systematic method for identifying and recording defective and unfinished work. | A | B | C | D |
|--------|------------------------------------------------------------------------------------------------|---|---|---|---|

### 6.6. Site operations

- |        |                                                                                                |   |   |   |   |
|--------|------------------------------------------------------------------------------------------------|---|---|---|---|
| 6.6.1. | There will be a systematic method for identifying and recording defective and unfinished work. | A | B | C | D |
|--------|------------------------------------------------------------------------------------------------|---|---|---|---|

## 7. Commissioning and operations

### 7.1. Feasibility design

- |        |                                                                                                |   |   |   |   |
|--------|------------------------------------------------------------------------------------------------|---|---|---|---|
| 7.1.1. | There will be a systematic assessment of whether special equipment for operations is required. | A | B | C | D |
| 7.1.2. | The operating strategy will be established.                                                    | A | B | C | D |
| 7.1.3. | There will be a systematic assessment of special personnel skills required for operation.      | A | B | C | D |
| 7.1.4. | A commissioning strategy will be prepared.                                                     | A | B | C | D |
| 7.1.5. | A decommissioning strategy will be prepared.                                                   | A | B | C | D |

### 7.2. Scheme design

- |        |                                                                                             |   |   |   |   |
|--------|---------------------------------------------------------------------------------------------|---|---|---|---|
| 7.2.1. | There will be a systematic evaluation of what special equipment for operations is required. | A | B | C | D |
| 7.2.2. | The operations and maintenance plan will be prepared.                                       | A | B | C | D |
| 7.2.3. | There will be a systematic evaluation of special personnel skills required for operation.   | A | B | C | D |
| 7.2.4. | A commissioning plan will be prepared.                                                      | A | B | C | D |
| 7.2.5. | A decommissioning plan will be prepared.                                                    | A | B | C | D |

### 7.3. Detail design

- |        |                                                             |   |   |   |   |
|--------|-------------------------------------------------------------|---|---|---|---|
| 7.3.1. | The operating plan will be updated.                         | A | B | C | D |
| 7.3.2. | Outline operating and maintenance manuals will be prepared. | A | B | C | D |
| 7.3.3. | The commissioning plan will be updated.                     | A | B | C | D |
| 7.3.4. | The decommissioning plan will be updated.                   | A | B | C | D |

### 7.4. Site construction

- |        |                                                              |   |   |   |   |
|--------|--------------------------------------------------------------|---|---|---|---|
| 7.4.1. | The operating plan will be updated.                          | A | B | C | D |
| 7.4.2. | Detailed operating and maintenance manuals will be prepared. | A | B | C | D |
| 7.4.3. | The commissioning plan will be updated.                      | A | B | C | D |
| 7.4.4. | The decommissioning plan will be updated.                    | A | B | C | D |

### 7.5. Site commissioning

- |        |                                                             |   |   |   |   |
|--------|-------------------------------------------------------------|---|---|---|---|
| 7.5.1. | The operating plan will be updated.                         | A | B | C | D |
| 7.5.2. | Detailed operating and maintenance manuals will be updated. | A | B | C | D |

### 7.6. Site operations

- |        |                                           |   |   |   |   |
|--------|-------------------------------------------|---|---|---|---|
| 7.6.1. | The decommissioning plan will be updated. | A | B | C | D |
|--------|-------------------------------------------|---|---|---|---|



### Section 3 Measures of process efficiency

- Project management - feasibility design phase**
  1. Ratio of cost for production of outline programme to value of completed project: \_\_\_\_\_
  2. Ratio of cost for production of cost estimate for the development to value of completed project: \_\_\_\_\_
- Project management - Scheme design phase**
  3. Ratio of cost for production of cost estimate for the project to value of completed project: \_\_\_\_\_
- Project management - Site construction phase**
  4. Ratio of costs for monitoring of cost and schedule estimates to value of project: \_\_\_\_\_
- Engineering - scheme design phase**
  5. Ratio of costs for production of outline technical specifications to value of completed project: \_\_\_\_\_
- Engineering - detail design phase**
  6. Ratio of costs for production of schedules for equipment and materials to value of completed project: \_\_\_\_\_
- Regulatory compliance and safety - feasibility design phase**
  7. Ratio of costs for production of HAZOP to value of completed project: \_\_\_\_\_
  8. Ratio of costs for production of baseline environmental data requirements to value of completed project: \_\_\_\_\_
  9. Ratio of costs for production of regulatory and planning requirements to value of completed project: \_\_\_\_\_
- Regulatory compliance and safety - scheme design phase**
  10. Ratio of costs for HAZAN to value of completed project: \_\_\_\_\_
- Regulatory compliance and safety - detail design phase**
  11. Ratio of costs for production of site safety plan to value of completed project: \_\_\_\_\_
- Procurement - feasibility design phase**
  12. Ratio of costs for preparing technical specifications and contract documentation to value contracts let in this phase: \_\_\_\_\_
- Procurement - scheme design phase**
  13. Ratio of costs for preparing technical specifications and contract documentation to value of contracts let in this phase: \_\_\_\_\_

14. **Procurement - detail design phase**  
Ratio of costs for preparing technical specifications and contract documentation to value of contracts let in this phase: \_\_\_\_\_
15. **Procurement - site construction phase**  
Ratio of costs for preparing technical specifications and contract documentation to value of contracts let: \_\_\_\_\_
16. **Construction - detail design phase**  
Ratio of costs for production of detailed construction implementation plan to value of completed project: \_\_\_\_\_
17. **Commissioning and operations - scheme design phase**  
Ratio of costs for preparing commissioning plan to value of completed project: \_\_\_\_\_

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