



# Making a Better Job of Software Quality with Total Quality Management

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## ABSTRACT

Established opinion tends to consider that a quality system for technology based design relies on two 'legs':

- \* Life cycle activities (specification, development etc);
- \* Supporting activities (configuration management, document control etc).

These activities are specified by ISO 9000-3.

However, any system needs a minimum of three 'legs' for stability (eg tripod). That third leg, for a quality system, is effective management support of the project team. A Total Quality Management philosophy can provide this essential third 'leg', by providing a holistic approach which encourages every member of the team to seek improvements for the greater good of the organisation. Implicit within this statement is the recognition that customer satisfaction (internal or external) and business objectives are inseparable.

## WHAT IS TOTAL QUALITY MANAGEMENT?

The recent (August 1992) Department of Trade and Industry Henderson Report on a proposed United Kingdom Total Quality Award defines TQM as:

"A way of managing an organisation to ensure the satisfaction, at every stage, of the needs and expectations of both internal and external customers - that is, shareholders, consumers of it's goods and services, employees and the community in which it operates - by means of every job, every process being carried out right, first and every time".

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The European Quality Award, established at the initiative of the European Quality Foundation for Quality Management, makes it's award by assessing nine categories of an organisation's functions:-

The ENABLING functions being: AND the RESULTS functions being:

- |                        |                          |
|------------------------|--------------------------|
| - Leadership;          | - Customer Satisfaction; |
| - Policy and Strategy; | - People Satisfaction;   |
| - People Management;   | - Impact on Society;     |
| - Resources;           | - Business Results.      |
| - Processes.           |                          |

How do these items fit into our software quality scenario?

How can we relate the more subjective items in the above lists with the definitions and standards that are encompassed within BS5750 and ISO 9000-3? What model should we use to guide us?

When we have the fundamental relationships between these items and ISO 9000-3 firmly established in our minds, then we are in a position to use the practical aspects of TQM within our Software Quality Management Strategy. The tools and techniques for TQM are well documented in many well written books. What I propose to you is the guiding philosophy within which these tools and techniques should be used (ie provision of the third 'stabilizing' leg).

### THE 'GRATRIX' MODEL

Figure 1 illustrates the nature of the relationship between Culture Change and a Quality Management System (or Framework), with ISO 9000 shown as an example of such a framework.

When an organisation has not embarked on the road to Culture Change, and has no QM System, then there is no Quality Management. If the organisation decides to develop a QM System (or uses one 'off the shelf' - eg BS5750), but ignores the Culture Change issues, then 'Mock' Quality Management exists - expensive bureaucracy without the benefits. It's worth remembering that when an organisation establishes a 'Mock' Quality Management System, current procedures and practices can become ossified after the Quality Assessment: "We've got ISO 9000 - don't change anything in case we compromise our assessment". One of the benefits of the TQM approach is the process improvement that can be incorporated in your Quality Initiative.

Many successful organisations either consciously or unconsciously work on Culture Change without having a QM System. They are 'Developers'. It is when the organisation works at the Culture Change AND their QM System, that Total Quality Management evolves.

The most cost effective route to TQM is to initially tackle the Culture Change. The diagram shows that the first part of this journey is to develop the right attitude in the team (note 'team' is the term used - not 'staff', 'employee' or 'worker'. TQM means that we all work together as a team!). The superimposition on the vertical axis shows that after the absorption of attitude development, then a process of further Culture Change, linked with QM System implementation leads to TQM.

Finally we see that the ultimate purpose of TQM can be Total Customer Satisfaction. This is a logical outcome - a TQM initiative is Total Common Sense for our organisations.

It should be stressed that the attitude alignment that is necessary for the right cultural environment does not happen overnight. There is no quick fix. When we make the decision to move our organisation toward TQM, we need to recognise that we will have to overcome prejudice, organisation politics and other negative aspects of our business social systems; that these aspects have sometimes built up over many years. Departmental boundaries can cause havoc with optimising the effectiveness of the customer chain. Customer chains do not always take account of hierarchical management structures - customer chains take account of added value at each point in the product design, manufacture and delivery process. Failure to recognise this is why so many managers are now finding themselves looking for 'more rewarding opportunities' in the labour market.

## THE CUSTOMER CHAIN

The customer chain is the key to effective generation and regeneration of a profitable enterprise. Figures 2a and 2b show how this chain is built from internal and external suppliers and customers and how it cuts across the organisational hierarchy.

Whether we are analysts or coders, testers or project managers, we are all customers of the persons that supply us with the information and materiel (our 'inputs') that enables us to add value when we carry out our processes. Similarly, we are all suppliers to the persons who receive our outputs.

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Doesn't it make sense that we should always work to please our customers, be they in another organisation, or in the department next door? Isn't it a good idea that we should ensure we supply the inputs that our customer really wants for s(he) to complete his/her process without the expense of rejected goods and services and their subsequent rework?

It is estimated that the Cost of Quality (ie rework costs etc) in a service organisation may amount to 40% off the profit line. Whether it's a letter sent back for retyping because of poor drafting, or a bug caused by poor design practice - that Cost of Quality eventually affects us all, in terms of lost profit and (internal or external) customer dissatisfaction.

Cost of Quality reduces added value - normally for the next person in the customer chain. Make it your commitment to your customers, that you will get things right before delivery. Because in doing so, you not only save their time, eventually you will save your time as well.

**I'M TOO BUSY!**

The fire fighting syndrome is suffered by most people. However, crisis driven work is normally 'interrupt driven'. It's easy to be busy when we are constantly dealing with crises. It also ensures that we feel good and that we are earning our bread. But, it's contribution to the progress of the organisation must be questioned. Constant fire fighting prevents the organisation moving forward. This is because of it's potential for causing Costs of Quality - the design review that is conveniently circumvented may cause major corrective action expenditure further into the project. Planned process based activity must have time allocated - or it will never happen. Your most important plan should be your personal TQM plan - in other words your commitment to the principles and the practice of TQM, as this will gradually release resources for all your other activities. Fire fighting can be a sign of procrastination - in other words postponing doing something that we should be doing NOW! It is important that we make time for both planned and crisis activity. Why not make your crisis activity fit into your planned activity?

## PROCESS IDENTIFICATION AND IMPROVEMENT

A key part of identifying the customer chain is to identify each process and it's interfaces. When this work is completed, you have a picture of how information and other materiel flows through your organisation.

Figure 3 shows how complex processes may be. This example shows the process for supporting dozens of internal customers by a database administration department within Thames Water Plc. Note the degree of specification at the interface between the Database Administration and the Operational Sites; it is at the process interfaces that most errors normally occur. Sound process analysis can pay dividends in assuring the quality of such interfaces.

This aspect of TQM is never complete. As you identify and use your processes and become more involved in your search for constant improvement, so you will find better ways to complete the job - right first time. As you find yourself more deeply involved and committed to process improvement, so will you discover the benefits of empowerment.

## EMPOWERMENT

It was Calvin Coolidge - a 19th century President of the United States of America who said, "The most under utilised resource that we have in our country is unrealised human potential".

Another little known fact - every member of your organisation comes - not only with two arms and two legs, but also a free brain! Also, everyone - without exemption - given the right circumstances will use their brain to the maximum of their ability. When considering that maximum, it's worth bearing in mind that Albert Einstein was estimated to use about 15% of his - most people use 2% or less!!

People are a key resource - especially in the Software Industry. How can we maximise what people give to an organisation, and at the same time, what they get out of it?

One of the primary tasks of executives and managers is to find ways of releasing that latent potential that everyone in their team has. We all have gold mines between our ears. Empowerment helps us dig for it!

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How do you know if you are 'empowered'?

Try this simple test:

- \* Do you 'own' your job?  
(or does your organisation own it?)
- \* Are you a truly responsible person?  
(or do you just do as you are told?)
- \* Do you add value in your job?  
(or doesn't your job really matter?)
- \* Do you know where you stand with your customers, suppliers and managers?  
(or are you not sure?)
- \* Do you have a say in how things are done?  
(or do you keep quiet because it's safer?)
- \* Do you feel that your job is a part of who you are?  
(or do you feel your job is remote from your values and beliefs?)
- \* Do you have control over your work?  
(or do you have little or no control over your work?)

As you will see from your answers, empowerment means playing a full and proactive part in your role within your organisation. In order to do this, your role must be in agreement with your value and beliefs, and must be a part of your goals.

### FRAMES OF REFERENCE

We need to ensure that we have the right map, or frame of reference in order to take advantage of empowerment in the workplace. If we are able to answer "Yes" to the questions asked earlier on, but we have internal conflicts within us, then we are in danger of driving our lives and our jobs doing everything right, but still not reaching our goals. Just as charity starts at home, so empowerment starts within ourselves; we need to ensure we have a value and belief framework that is congruent with our personal and work goals.

## 50 LINES OF CODE EACH DAY (keeps the management away!)

Because of the intellectual nature of software engineering, in many cases there is a tendency for management to adopt a 'hands off' approach to the software team. In cases such as this of course, we could say that the team are truly empowered -because no one else knows what they are doing!! Black art magicians!! Everyone in the software team is busy writing and modifying code - and Management think the software team are whiz kids - because they always get the company out of trouble by fixing the bugs that were caused by poor development processes. Is this a healthy customer chain? What is the net value added to the company by such practices? What is the opportunity cost of such hands off management - caused by ignorance of the Quality Managed approach to the development process?

The team may be efficient in terms of code generation, but are they effective? When we investigate the difference between these two terms, we find that efficiency can mean 'doing things right, whereas effectiveness means 'doing the right things' - in other words, effectiveness means working towards meaningful goals. I propose to you that the purpose of the human relations (ie cultural) and TQM tools and techniques, in conjunction with the QM framework (eg ISO 9000-3) as shown in the Gratrix is to assure that optimum efficiency is reached, thus ensuring maximum effectiveness for the organisation.

## SUMMARY

TQM is enabled by two complementary actions within your organisation:

1. A programme of culture change.
2. Implementing a Q.M. System (such as ISO 9000-3) that specifies and records how your organisation goes about it's business.

The Total Quality Management approach ensures software developers are motivated toward Quality Management. It enables developers to square the circle of using innovation and intuition within the boundaries of a Quality Management framework. Finally, bearing in mind we all have to earn a living by paying our way, TQM ensures business priorities are addressed. Remember - TQM is not a bureaucratic black art. It is TOTAL COMMON SENSE. It is also a ENABLING STRATEGIC IMPERATIVE that can release the latent potential of every member of your team. In doing so, TQM can benefit every activity in your organisation.



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### References:

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3. 'Quality Management for Software' - Daily;
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5. 'Creating Culture Change: The Key to Successful Total Quality Management' - Atkinson;
6. 'TQM, Watchword for the 1990s' - Faith. Local Government Executive, September 1992, p45;
7. 'What Total Quality Management Is All About' - Faith;
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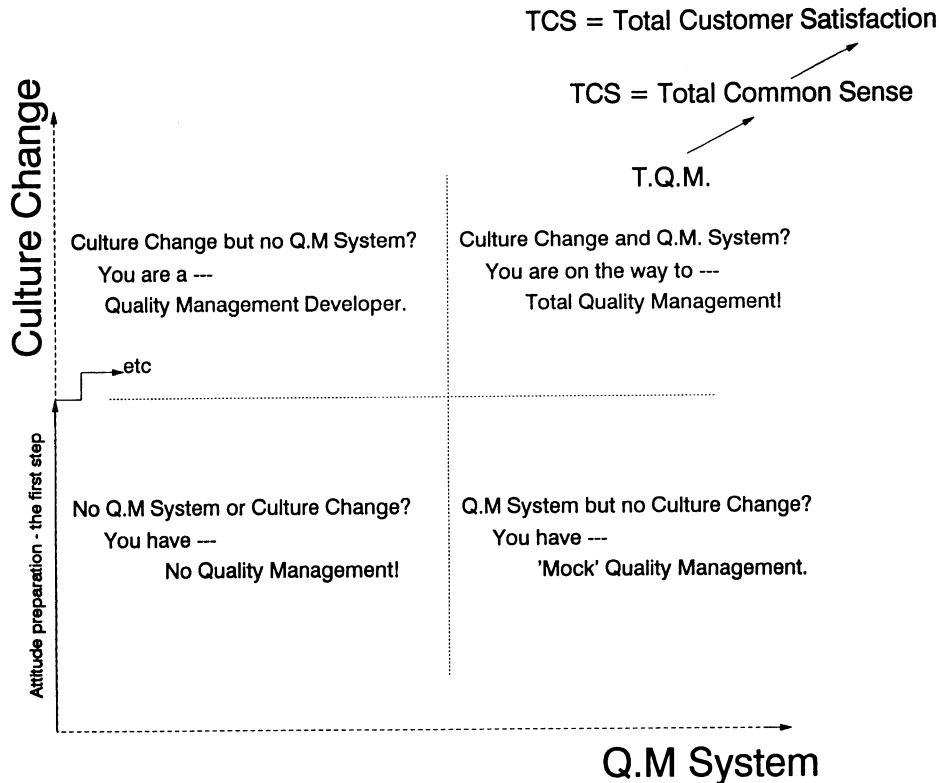
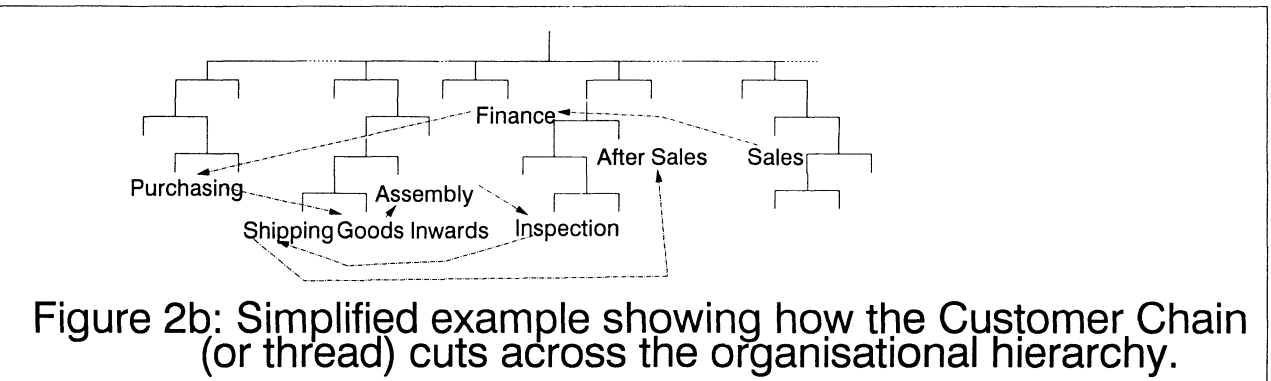
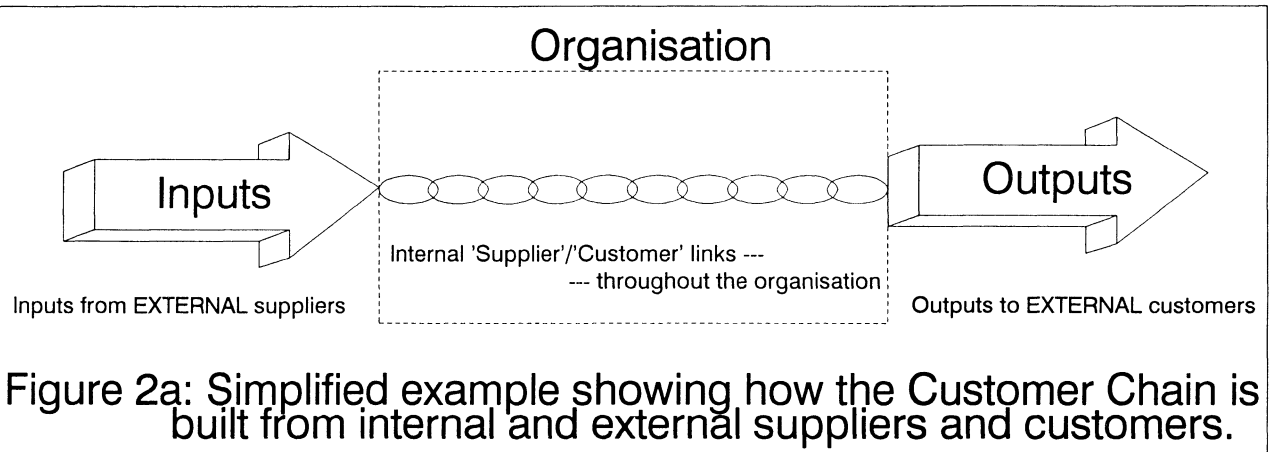


Figure 1: Gratrix illustrating the relationship between Culture Change, a Quality Management Framework and Total Quality Management.





## Process Flow Diagram - Responsible Officer Support

### Operational Control Systems

### Operational Sites

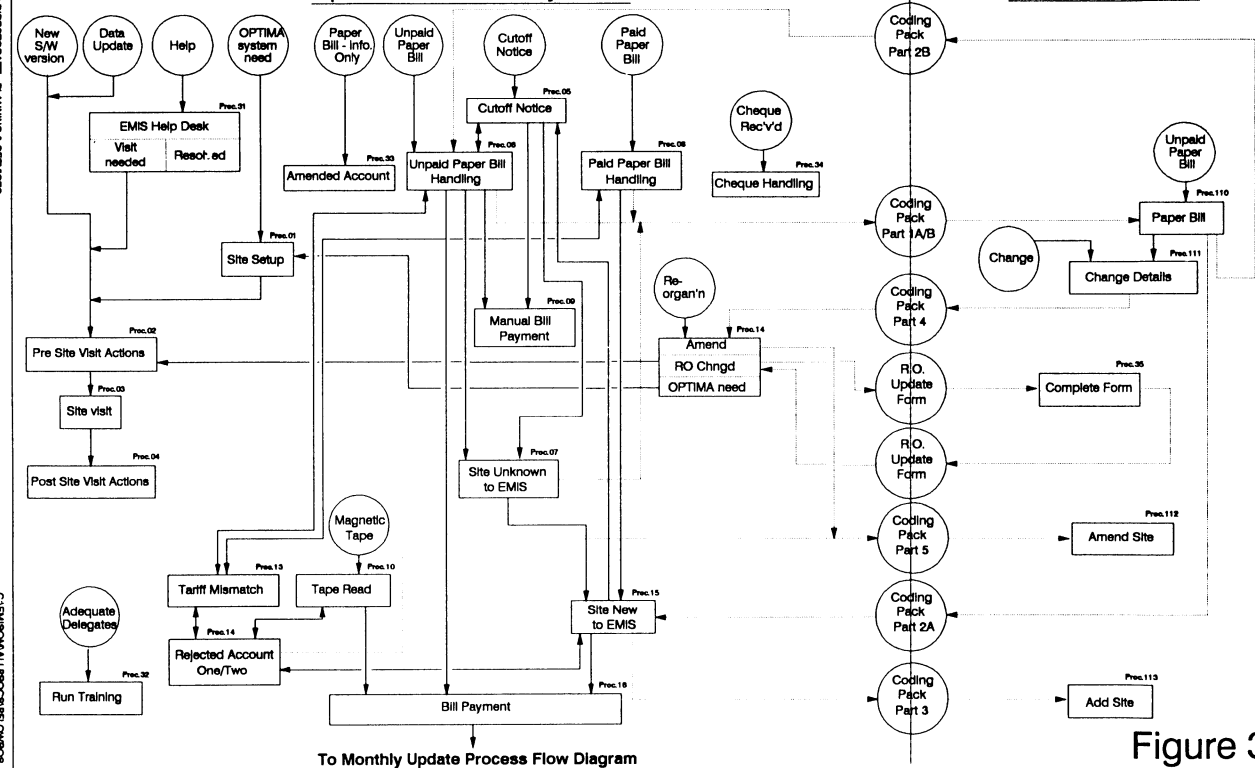


Figure 3