Total quality project management of business systems in the banking industry

Garry Francis Court
University of Wollongong

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TOTAL QUALITY PROJECT
MANAGEMENT OF BUSINESS SYSTEMS
IN THE BANKING INDUSTRY

"A thesis submitted in partial fulfillment of the requirements of the award of the degree"

HONOURS MASTERS OF TOTAL QUALITY MANAGEMENT

FROM

UNIVERSITY OF WOLLONGONG

by

Garry Francis Court Dip Sc(TQM)

Department of Mechanical Engineering

1996
I wish to dedicate this thesis to my wife Elizabeth and children Phillip and Nadia without whose patience, support and understanding its completion would not have been possible.

I would like to thank Associate Professor Victor Stewart for his assistance as mentor in the compilation of the thesis.
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SYNOPSIS

This thesis seeks to identify the key features of an approach to Project Management which, through the tailored integration and implementation of Total Quality Management philosophies, might serve to establish a set of core values for a "Total Quality Project Management" ethic.

The study focuses on the pressures and constraints placed on research and development processes within the Australian banking industry, and how these conflict with the implementation of Total Quality Management.

The Australian banking industry of today is an intensely consumer oriented activity with change happening at an alarming rate. Though there are many ingredients to this change the two major ones have been:

- the de-regulation of the industry by the Commonwealth Government in the mid 1980s which created a competitive climate which forced banks to implement change to survive and compete in this new market. The pressure to change continues unabated as banks strive for a competitive advantage.

- Continuous advances in technology, particularly over the last decade, which have vastly changed the face of the banking industry in this country.
As, of today, any financial transaction undertaken has a significant technological component, the consequence being that research and development within the industry focuses largely on improving service by the **Quality Deployment** of technology.

However, the speed at which technology is advancing means that if the development cycle is too long, there is a risk that the system introduced will be obsolete before it is delivered.

There is therefore a fear that by following the Japanese philosophy of "taking small steps to get it right the first time", a bank may be left trailing in the wake of its more adventurous competitors.

The study therefore concentrates on the area of achieving quality in the area of technology development, while responding to the particular pressures placed on project delivery.

A literature study is undertaken of contemporary project management philosophies. Drawing on a discussion on specific quality philosophies, a framework is developed for implementing Project Management, employing TQM principles, in successful development of business systems within the banking industry.

Features of the model include:

- the establishment and retention of a TQM customer focused culture,
• the setting of clearly defined quality goals,
• the use of effective Human Resource Management in the development of high-performance teams,
• the use of value analysis in determining the viability of a project,
• an emphasis being placed on internal customer satisfaction by involvement of end users in the design and development of new systems,
• establishment of quality supplier relationships, and,
• use of quality tools in the measurement, design and management of quality projects.

In particular the model embodies a framework for research and development of successful business systems within the banking industry. The methodologies employed in the undertaking of two business system projects are then tested against this model to validate its content.

Conclusions are subsequently drawn on the benefits and disadvantages of the employment of Total Quality Management in Project Management of the introduction of business systems within the banking industry.

The success of a business system project is gauged by the quality of service provided by the delivered system.
The model emphasises the involvement of the internal end user of the business system who, it is argued, is in effect the major customer of a business system project. They, after all, must use the system as a tool to provide the external customer with quality service and satisfaction.
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1. INTRODUCTION

1.1 Aim of the Thesis

This thesis looks at the implementation of project management principles in today's business world and studies how the integration of Total Quality Management philosophies may be used to establish a set of core values for a "Total Quality Project Management" ethic.

The broad aim of the study is to examine current project management methods, explore the philosophies of Total Quality Management and develop a "New Quality" project management model integrating these philosophies.

The more specific aim is to develop a framework for use in the field of business system technology development within the Australian Banking industry.

1.2 Methodology

The methodology used follows the following steps:

- Conduct of a literature survey to establish "conventional" project management methods and identify TQM philosophies appropriate to this area.

- An examination of the relevance of Total Quality Management philosophies and techniques to project management.

- Development of a theoretical framework for project management integrating appropriate TQM philosophies.
• Testing of this model against real life case studies to establish its validity.

• Discussion of the results of testing and refinement of the "Total Quality" model.

• Drawing of conclusions on the benefits and disadvantages of adoption of the model.

2. LITERATURE SURVEY

2.1 Overview

The examination of Project Management literature resulted in identification of a mixture of conventional project management philosophies (such as Lock (1987), Kenzner (1984) and Killian (1971) and those, generally more recent publications(such as Frame (1994), Lewis & Smith (1994) and Tippett & Waite, (1994)) incorporating TQM philosophies.

Sections 3 to 15 cover conventional project literature surveyed while Sections 16 to 18 cover texts relating specifically to Total Quality Management.

3. THE PROJECT

3.1 What is a Project?

It is a planned and structured approach to altering the current state.

Webster's New World Dictionary (1982) defines a project as "That which is projected or designed: something intended or devised: a scheme: design: plan".
3.2 Project Lifespan

A project has a finite lifespan and is conducted within a specific time span.

Beckhard & Pritchard (1992) define the life of a project as the transitional stage between the present state and the future state.

3.3 Characteristics & Objectives of a Project

Lock (1987) lists the characteristics and objectives of a project as:

3.3.1 Characteristics

- Everything is one-off - they are unique.
- Designs are new and usually unproven.
- Every industrial or commercial project is a risk venture.

3.3.2 Objectives

- To be completed on time.
- To be completed within budget.
- To meet specifications.

How these objectives are met form part of the criteria used for judging the success of a project (Morris & Hough, 1987).
4. PROJECT TYPES

A project may relate to any of a number of disciplines in the construction, manufacturing or service sector. Figure 1 displays the criteria which may be used to identify project types based on their dimensions and risk factors.

Though banks conduct construction projects, (e.g. building a new branch), the majority of bank projects relate to the service component of the conduct of their business. These projects can be classed as business system projects.

4.1 Business System Projects

A study by Keltner & Finegold (1996) of banking institutions in the United States found that market trends have led to profound changes in the banking industry.

The relaxation of regulatory restrictions have allowed banking institutions to expand their range of banking services.

These changes have increased competition for the traditional banking markets in Australia by the entry of new players in the form of Building Societies, Credit Unions and overseas banks.

This in turn has been compounded by the shift in consumer demand patterns.
### Figure 1  CRITERIA FOR IDENTIFYING PROJECT TYPES

<table>
<thead>
<tr>
<th>SOURCE of RISK</th>
<th>DIMENSION</th>
<th>MINIMUM RISK/EFFORT</th>
<th>MAXIMUM RISK/EFFORT</th>
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<tr>
<td>Project Related</td>
<td>Project size</td>
<td>Single function</td>
<td>Multi-function</td>
</tr>
<tr>
<td></td>
<td>Emphasis &amp; volume</td>
<td>Process</td>
<td>Data</td>
</tr>
<tr>
<td></td>
<td>Urgency</td>
<td>Growing need</td>
<td>Urgent</td>
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<td></td>
<td>Business complexity</td>
<td>Simple</td>
<td>Specialist</td>
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<tr>
<td>User Related</td>
<td>User literacy</td>
<td>High literacy</td>
<td>Naive</td>
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<tr>
<td></td>
<td>Ownership/use</td>
<td>Single unit/function</td>
<td>Corporate</td>
</tr>
<tr>
<td></td>
<td>Definition</td>
<td>Complete &amp; clear</td>
<td>Uncertain</td>
</tr>
<tr>
<td></td>
<td>Manual procedures</td>
<td>Minor adjustment</td>
<td>Radical change</td>
</tr>
<tr>
<td>Environmental</td>
<td>Volatility</td>
<td>Static requirement</td>
<td>Changing requirements</td>
</tr>
<tr>
<td></td>
<td>Business alignment</td>
<td>Support function</td>
<td>Strategic role</td>
</tr>
<tr>
<td></td>
<td>System lifespan</td>
<td>One off/research</td>
<td>Integral to future</td>
</tr>
<tr>
<td></td>
<td>Delivery</td>
<td>Batch</td>
<td>Real time</td>
</tr>
<tr>
<td>Technical</td>
<td>Technological construction</td>
<td>Tried and true</td>
<td>Leading/lagging</td>
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<tr>
<td></td>
<td>Data source</td>
<td>Validated &amp; factual</td>
<td>External source/opinion</td>
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<tr>
<td></td>
<td>Standards</td>
<td>Commonly used</td>
<td>Poor standards</td>
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<tr>
<td>IT Strategy</td>
<td>Asset-Based</td>
<td>Effective assets in place</td>
<td>New roles, few assets</td>
</tr>
<tr>
<td></td>
<td>Open Systems</td>
<td>Experienced technicians</td>
<td>New technology and skills</td>
</tr>
<tr>
<td></td>
<td>Corporate Integration</td>
<td>Valid corporate model available</td>
<td>New roles, no models</td>
</tr>
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Keltner & Finegold (1996) found that a few banks have responded to the market by raising the quality of their service by instituting a customer focus to development of new products and technological processes.
Broadbent & Weill (1991), in a study of business and information strategy alignments within the banking industry, found that information technology was providing a competitive advantage for an organisation over its competitors.

The pace of change will not decrease as consumers of the next century will demand banking services vastly different than those of today (Okkense, 1996).

Takac (1996) states that expected efficiencies from introduction of technology delivery services have not largely materialized. The result has been that practically all Australian financial institutions have implemented projects to re-engineer their processes.

The constantly changing face of the market means that the need for projects within the banking industry will remain an ongoing requirement. This causes a cultural problem in the traditional hierarchical management structure of the banking industry with various projects competing for available resources.

Business systems are customer driven and are the methods employed by management to produce customer requirements and to obtain desired business results. Business system projects are unlike others.
Traditionally projects for the development of computer based systems have been managed using formal development methods, often based on the assumption that requirements can be precisely defined and systems delivered exactly to specifications.

In reality development of business systems is affected by increasing business competition and rapid changes in technology.

Rigid definition of system requirements results in delivery of systems which, due to changed business requirements and advances in technology, are outmoded by the time they are implemented.

Use of an "evolutionary" approach to development and advances in system development technology requires versatility and flexibility in those projects associated with business system development.

4.2 Technology Projects

Attitudes and actions which influence the effectiveness of an organisation's implementation of change include:

- Recognition by executive management of the need to fully integrate forward planning which includes the use of technological advances in the strategic planning of the organisation.
• Thorough analysis of the benefits and drawbacks of the use of new technological breakthroughs in organisational strategies (i.e. risk factors involved in the development of "leading edge technology") designed to give the organisation a commanding market edge.

Cleland & Bursic (1992,p4) split technology projects into two basic components:

• The core technology that goes into making the product or providing the service; and

• The support technology that delivers the product or service.

Functions of the project dealing with the core technology are described as the "whats" of the project while functions dealing with the support technology are dealing with the "hows" of the project.

However, technology projects also involve a non-technology component. The "human factors" involved deal with the environmental impact of the introduction of technology.

4.3 Technology Transfer

Once technology is developed its effective transfer to other parts of the organisation involves breaking down functional barriers.
Two means of managing this technology transfer are the product design team and the strategic alliance (Cleland & Bursic, 1992, p29).

### 4.3.1 Product Design Team

The team is cross-functional and composed of individuals from research & development, design, engineering, manufacturing, marketing, purchasing, and other functional groups. The combination of their varying expertise and backgrounds allows for the reduction in the time between conception and development and release to the market (Cleland & Bursic, 1992).

Zirger & Hartley (1996) found that there was a strong relationship between development time and the degree of cross functionalising in teams.

Though a relatively new approach its effectiveness in reduction of project time frames has generally proven particularly advantageous, considering the speed of technological change.

### 4.3.2 Strategic Alliance

There are numerous ways in which strategic alliances, even those forged with direct competitors, can be mutually beneficial in providing ways in which advances in technology can be introduced.
An example of a strategic alliance which is aimed at providing benefits to all parties is that formed by Australian banks to implement electronic interchange of data in 1996 which will negate the necessity for the enormous daily paper transfer between banks.

A study by Murray (1995) found that 50% of US domestic strategic alliances were among firms in the service sector. Further, Morris & Herget (1987) found that industries forming strategic alliances typically save high entry costs and large operating risks.

5. PROJECT MANAGEMENT

5.1 What is Project Management?

Project Management is “the process of managing ad hoc efforts in an organisation leading to satisfaction of specific technical performance, cost, and schedule and objectives” (Cleland & Bursic, 1992).

The purpose of Project Management is “the establishment of a practical system to effectively plan, organise, implement, and control all resources and activities needed to successfully complete the project” (Lewis & Smith, 1994; Kenzner, 1984).
5.2 Development of Project Management.

If we look at the wonders of the ancient world we see that construction of such enormous buildings as the Egyptian pyramids and the Great Wall of China required design, planning and material and resources management on a scale equal to the largest project undertaken today. However project management, as we know it today, only came into being in the era following World War II.

The cold war led to the need for new management tools to effectively carry out mammoth projects of unprecedented size and complexity (Frame, 1994). Gantt and PERT analysis and tracking (Camp, 1989) are just two of the tools developed specifically for project management.

Further advances in computer technology have led to a variety of project management software being available. The 1950s saw project management evolve based on the matrix organisation concept. By the 1960s the ethic began to spread from construction and manufacturing industries to the service industry, including the finance industry.

The commencement of the technology age in banking heralded an era of increased competition. If banks hoped to compete they had to efficiently and effectively implement change, much of which was technology driven.

The technology driven project in particular required use of expert skills which were gathered together in teams to design, construct and implement the technology involved.
Broadbent & Weill (1991) found that the most effective information based development work seems to take place when managed by those closest to the business needs. The extent and nature of the business / IT interaction was found as a critical factor in the development environment.

Technology advances have provided to banks excellent opportunities to widen their scope of service outside limitations imposed by geographical location.

However, early projects aimed at introducing systems to cut costs did not focus on the human factors affected (Friedman & Cornford, 1989, P24).

The 1980s, however, saw the commencement of a change to focusing more on customer requirements. The success of the Japanese customer focused approach began a slow but sure change in how Western Organisations managed change.

6. DEFINING THE PROJECT

The planning of a project begins with defining its aim, determining its size and justifying its undertaking.

6.1 Project Size

Project sizes vary considerably. A project can be small, involving a handful of resources with a lifespan of a week to one which spreads over a protracted period of time and consumes enormous amounts of human, material and financial resources.
Size is a relative characteristic. The project size and lifespan are determined by its strategic importance and is affected by such factors as complexity, competitive positioning and delivery deadlines. Also, what is manageable in terms of both costs and time frame for one organisation can present a major problem for another. Project size is a vital factor in estimating total development costs, effort, actual duration, and resources required.

The larger the project the greater the possibility of it progressing past its deadline. Size also implies complexity. Studies of system life cycles indicate that, under certain circumstances, large projects are never fully completed, but just continue to evolve. Such evolution can lead to the deterioration of the system and project's structure.

Continual maintenance, which is then necessary, only adds to the system's diminishing cost effectiveness.

6.1.1 Function Point Analysis

Function Point Analysis (FPA) is suggested in some literature (e.g. Folkes and Stubenvoll (1992), Speranza & Vercellis (1993)) as the only sound way to estimate the size of a project when:

- Choices of solutions are available.
- The technology and methods are new.
- Frequent changes of plan are expected.
FPA compliments accelerated development in that it:

- Is ideally suited to incremental delivery of benefits.
- Encourages user involvement and understanding.
- Quickly generates productivity measures for use in future estimating.
- Can be used with any technology (even mixed).
- Can be used to measure quality and qualities.
- Can be used for internal IT, end-user or contractor-developed systems.
- Can be used for "maintenance" activities.

FPA must be used with an understanding of its purpose and shortcomings. Folkes and Stubenvoll (1992) advocate adopting the purpose and method of FPA rather than their blind acceptance.

6.2 Project Justification

There are various strategies used to determine which projects will yield the highest return on investment. These include:

- Economic models, characterised by cost benefit analysis methods,
- Scoring models, involving decision criteria weighted on the basis of managerial judgment,
- Feasibility studies, in-depth evaluation of technical, economic and operational factors, and
• Value analysis, which emphasises potential value in lieu of cost benefits.

While these methods provide a set of measurable standards for project evaluation, the selection should also include a logical element whereby rational consensus complements technical criteria (Barlow, 1991).

7. PHASES OF THE DEVELOPMENT PROJECT

There are a number of phases of a project, all of which involve separate but interdependent activities.

The primary phases of a product development project are described by Lock (1987) as:

• Concept Development Phase
• Product Planning Phase
• Product/Process Engineering Phase
• Process Management
• Pilot Production and Rollout

7.1 Concept Development Phase

This phase includes the definition of the product architecture to be used, the conceptual design of the product, and identification of the product market.

Though for success the concept must be sound, studies have found (e.g. Myer & Marquis, 1969; Rubenstein, 1974) that identifying and understanding customers needs was substantially more important than the architecture used.
7.2 Product Planning Phase

In this stage a model of the product is built and small scale testing undertaken. "Products are more likely to be successful if they are planned and implemented well" (Zirger & Maidique, 1990, p879).

Before the full scale development is approved the financial viability of development is gauged by this testing, often with discussion and feedback from potential customers.

7.3 Product/Process Engineering Phase

This phase includes the detailed design and building and testing of a prototype.

7.4 Process Management

Process Management ensures that all key processes are working together to guarantee customer satisfaction and maximizes operational effectiveness. Here problem solving efforts are cross-functional and require involvement of the process owner.

Who the process owner is must be clearly identified at the outset of the project.
7.5 Pilot Production and Rollout

This final stage covers the testing of the product at a commercial level by the integration of the components of the product being released in limited numbers to the marketplace. The final step is to increase production to full capacity.

Zirger & Maidique (1990) found that well coordinated cross-functional groups resulted in smooth execution of all phases of development.

8. PROJECT PLANNING & CONTROL

Projects are structured undertakings requiring planning and control which can be broadly broken into four phases:

- Project Planning.
- Project Timing.
- Resources allocation.
- Project control.

8.1 Project Planning

Planning is a dynamic process extended over time and involving a great deal of interaction.
Where a project is run by research and development, the developers are likely to perceive unforeseen engineering and financial problems occurring in a program as part of the inevitable risks associated with advanced research. However, when run by the business the problems can be easily attributed to the organisation’s indifference to Research and Development and its priorities.

There is a weakness in the management of intra-organisational depending relationships in traditional business management. In orthodox management decision making, as represented in Figure 2, problems are perceived as a consequence of some managerial preconception and tend to be explained in the light of those preconceptions.

**Figure 2  ORTHODOX DECISION MAKING**

```
1 Managerial Preconception

2 A Problem is Perceived

3 Conventional Explanation

4 Decision to Act

5 Implementation of Decision

6 Justification and Defence of Decision
```
The conventional explanation is then substituted for detailed analysis, leading to a decision to act which creates further problems and recommences the cycle.

The tendency is then to solve problems by developing new sources and channels for a given function.

Research by Gupta & Wilemon (1990), Clark & Fujimoto (1990) and Imai et al. (1985) found that the establishment of strong supplier relationships can save costs while ensuring improvement of the quality of product and service provided.

However, it is not unanimously agreed how and when suppliers are appropriately involved in the development process (Brown & Eisenhardt, 1995).

A set of guidelines for establishing a comfortable level of detail in a project (Leavitt and Nunn, 1994, p72) include:

- Tasks having quantifiable inputs, outputs and identifiable points of progress.
- The duration of any one task being limited to no more than 50% of the total project duration.
- For long duration tasks processing errors can lead to large miscalculations in estimated dates.
- The length of task duration should be not more than 3 update cycles.
- For each task there should be one person accountable.
8.1.1 Aggregate Project Planning

While, in the vast majority of organisations, multiple projects run concurrently (Payne, 1995) suggests up to 90%, by value, of all projects occur in a multi-project environment), the focus of management on each project is generally individual. This involves, for management, decisions on the priority of individual projects and their coordination to meet the organisation's strategic objectives.

Clark & Wheelwright (1993) suggest that management and direction of these activities constitute the aggregate project plan and are an important part of the development strategy.

Spuhler and Biagini (1990) confirmed that “there is hardly a company to be found which does not launch more projects than it can master with the available resources”.

Planning of the project sequence allows for the establishment of a framework which will enable new projects to be added based on future business decisions, while also allowing for a more effective management of the organisation's resources.

This aggregate project plan helps overcome the common practice by an organisation of attempting too many projects at once, thus over-committing resources (Spuhler and Biagini, 1990).
8.2 Project Timing

Completion on time being one of the characteristics of a project (Lock, 1987) its management within a project is a key factor in the measurement of project success.

8.2.1 Project Time Scale

As a general rule the time scale for a project is based upon 1-2% of the time frame for the complete project planning (e.g. for a project with a life cycle of 1-2 years, a scale of weeks is used.)

Where available, figures for actual time taken for similar tasks in other projects are used in estimating task completion times (Pryor, 1993).

However, time to complete tasks is difficult to calculate. Where comparable times are unavailable extra contingencies should be allowed for. If a “guestimate” is the only obtainable estimate the following process (Pryor, 1993) is suggested:

- Estimate the minimum time the task should take to complete.
- Estimate the most likely duration for completion of the task.
- Estimate the maximum time the task should take to complete.
- Use a weighting of 1:4:1, add the estimates together and divide by 6 to give a weighted best estimate time.
8.3 Resource Allocation

Though resources allotted to a project consist primarily of the personnel assigned to the project, they also include dollars, computer time, purchased software, supplies, and management and support time. Resources may also be defined to include tools and methodologies used. The combination of time, effort and materials, must be all integrated in the correct proportion to ensure quality deliverables for a project. Too many resources assigned to complete a project can be just as counter-productive as too few.

One full-time team member does more work than 3 half-time members. (Kolinger, 1994).

8.4 Project Control

The extent to which authority is delegated to the project manager impacts upon his ability to control the project. The organisational reality of projects is that there is a reasoning behind the divorcing of responsibility and authority from the project manager. The following are some of the salient points:

- Projects are temporary, therefore it is difficult to justify allocation of resources to a project on a full time basis.
- Projects are unique - they do not involve day to day occurrences.
• Projects are systems - differing pieces linked together by team members with specialised skills and consequently quite often the team is continually changing.

• The nature of projects is such that human and material resources are borrowed rather than permanently assigned.

Frame (1991) offers four differing types of authority relating to project management.

• Formal - automatically conferred on the project manager when appointed to the project.

• Purse-String - conferred on the Project Manager if some budgetary discretion is held.

• Bureaucratic - this authority is based upon the project manager's understanding of the culture of the organisation.

• Technical - this authority is based upon the technical competence of the project manager.

8.4.1 Project Costing

Traditionally, the most common method of costing proposed projects has been to undertake a comparison of direct measurable costs of the project weighed against the perceived dollar return on investment.
In more recent times management has began to realise that this quantitative measurement fails to cover all costs. There is therefore an increasing tendency to incorporate intangible costs and benefits in the cost analysis of a project. However, there is still a widespread emphasis by management on the measurable return on investment.

8.4.2 Cost Control

The actual process of controlling costs is, unlike control of the time frame, not always a direct procedure. Though if a job runs late and management can take steps to expedite the work, control of costs is more difficult.

The principle of controlling costs within budget is more a matter of applying sound control principles before funds are committed.

8.4.3 Work Definition

Work to be performed should be defined in such a way that when it is accomplished, the project will be completed successfully. It is highly unlikely that any two project teams, attempting to develop the same business system within the same organisation would perform an identical set of tasks or activities in the same manner or sequence. Each project must therefore define its own work.
Standardised work processes are essential to business system development success. Stable and repeatable procedures are necessary if project managers are to effectively plan, schedule, and control.

Once the work is defined resources can be applied over time to accomplish the work.

Work is one of three interactive variables in any project whose negative effect during the course of the project can be a recipe for disaster. Of these variables establishing control of the work to be done allows adjustment of the other two in differing directions. More resources to do the same work in less time.

8.4.4 Project Management Tools

Developments in computer technology have made available hardware and software programs that can assist and improve project management (e.g. Easy ABC Plus, Protrack 1, Microsoft Project, etc.).

Among the advantages for project management are better visibility of efforts and results, shorter project completion times, better customer relations, lower project costs, and improved coordination and control of workers' efforts. For computerised project control to be successful the areas of planning, monitoring, control, cost information, and communication must be addressed.
Computer-based project management packages are highly structured and usually require users to adapt their working practices to the structure of the software (Corbitt, 1994). Among the features that should be available are ease of use, resource leveling, sort and report, and the ability to handle what if scenarios.

In the use of project management tools for scheduling and tracking it is essential that the tool does not drive the process. In extracting information for project management the key questions are:

• What is expected?
• What is the management reporting requirements?
• What questions need to be answered?
• What information is needed to manage the project?
• Is progress to be measured by phase or by deliverables?
• Are resources to be measured by hours worked on specific deliverables?
• Will resources even be measured?

9. MANAGEMENT PRIORITIES

"System improvement concerns such crucial areas of management as planning and control, decision-making processes, organisation, and information systems." (Imai, 1986, p94).
9.1 Strategic Planning

In nearly all instances the introduction of alternative management practices result in an organisation undergoing some form of change requiring amendment to existing systems or implementation of new ones (Tillery & Rutledge, 1991).

Increasing competition requires management to be proactive in their strategic considerations for the good of the organisation and its employees if they are to survive.

Introduction of a new business system is often results driven and seen by senior management as a method of obtaining a market edge in the short to medium term (i.e. short term objectives).

Implementation of change to the system then becomes driven by unreasonable time constraints. Failure to identify and eliminate existing problems with the system therefore leads to a lack of quality in the new / changed system.

Establishment of the strategic priorities of any project requires answers to questions on three basic issues:

- Why has the project been proposed?
- What are the organisational benefits which will flow from the project?
- What methods will be used to develop the project?
A successful organisation usually maintains a variety of projects, some of which are designer plans for implementing competitive technology.

Cleland & Bursic (1992) found that various types of projects found in successful companies include:

- Projects to modify existing products/processes to capture new markets, improve productivity or change the way business is conducted.
- Projects for concurrent engineering of products and processes.
- Projects that allow an organisation to enter a new field not covered by existing strategies.

9.2 Matrix Management

Meares (1993) sees today's new organisational theories as really being based on the matrix concept. The concentration of efforts provides better motivation for employees to act as a team, improves accountability for performance, and balances cost, technology, and schedule to meet requirements.

Matrix management combines the project or project team form with functional departmentation in a grid in which managers responsible for specific products or product lines tap the functional groups for people.

The matrix brings together specialists with a common expertise under one functional manager.
The matrix:

- Creates opportunities for greater standardisation across programs,
- Spreads corporate expertise over a wide base,
- Makes efficient use of research funds, and
- Provides checks and balances.

Lock (1987) lists two forms of matrix management in the project environment:

- **Shifting** Personnel in functional departments are moved between projects depending upon the workload and project cycle.

- **Fixed** Personnel in functional departments are assigned to the same project manager regardless of the project.

Traditionally under the matrix based structure, project managers have the right to request specific resources but the final decision of what resources will be committed rests with functional managers.

Three main problems identified by Killian (1971) for project managers are:

- Project priorities and competition for skilled resources may cause instability within an organisation.
• Long range planning can suffer as the organisation becomes more involved in filling the requirements of temporary projects.

• Growth and development of resources suffers when they are shifted from project to project.

The prime disadvantage of matrix management is the complexity of its operation due to its dual or multiple command structure.

In the "shifting" environment the sharing of skilled resources between projects can cause over commitment when one project's slippage results in a resource being required for two (or more) tasks in the same time frame.

In the "fixed" environment the skills base of the "shifting" environment is traded for availability of resources.

9.3 Project Politics

In a study of a post Apollo project Sayles and Chandler (1971) give an example of how the key centre attempted to obtain its own "mission control" function to enable it to check out directly its hardware at Cape Kennedy. Other organisational units were seeking to prevent outsiders from having any direct contact with their jurisdictions.

Thus one application-spacecraft project insisted that no outsiders (i.e. no one outside the project office) be allowed into any tracking station used by its flights.
Increase of internal responsibility, balanced by increased shared authority, provides a balance for these opposing trends.

10. HUMAN RESOURCE MANAGEMENT

The implementation of projects is centred around the workings of Teams. The establishment of a team based culture is therefore imperative to the quality of a project.

The role of Personnel Management has traditionally focused upon recruitment, placement, development and evolution of the individual rather than the group.

The concept of HR Management on a team basis is a relatively new one which has been found to contribute to the decrease in individual rivalries, cooperation between employees and a general increase in morale.

Keltner & Finegold (1996) found that service firms implementing Human Resource innovations effectively were the exception rather than the rule.

The central role of the team reflects in the fundamental shift in how work is viewed. Historically cooperation between the worker and management has not been encouraged, with such practices as management by objectives (MBO) and individual performance evaluation and promotion encouraging individual advancement rather than advancement of the group.
It is becoming increasingly evident that the success of every organisation is fully dependent on the adoption and effectiveness of developing a team approach.

Human Resource programs introduced, however, need to fit the organisation's culture.

To introduce a program, for example, which relies heavily on a democratic process to a company with an autocratic management style is a sure recipe for disaster.

Though a group of individuals can be productive (Lewis & Smith, 1994), formulation of a group to complete specified tasks is ineffective and unproductive.

The term team, however, has come to be accepted to describe a group of people who are goal oriented, interdependent, supportive of each other, loyal and empowered. The strong allegiance developed by individuals to others in the team goes a long way to accomplishing and often exceeding the organisation's goals for the task.

The key differences between Groups and Teams are shown in Figure 3.

10.1 The Team

Existing literature studies involvement of teams in project activities in a number of ways.

Broadly speaking project management involves the use of both cross-functional teams and task teams.
## Figure 3 GROUPS VERSUS TEAMS

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>TEAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Members think they are grouped together for administrative purposes only. Individuals work independently: sometimes at cross purposes with others.</td>
<td>• Members recognise their interdependence and understand that both personal and team goals are best accomplished with mutual support. Time is not wasted struggling over &quot;turf&quot; or attempting personal gain at the expense of others.</td>
</tr>
<tr>
<td>• People tend to focus on themselves because they are not sufficiently involved in planning the unit's objective. They approach their jobs simply as hired hands.</td>
<td>• Members feel a sense of ownership towards their jobs and units because they are committed to the goals they helped establish.</td>
</tr>
<tr>
<td>• Members are told what to do rather than being asked what the best approach would be. Suggestions are not encouraged.</td>
<td>• Members contribute to the success of the organisation by applying their unique talents and knowledge to team objectives.</td>
</tr>
<tr>
<td>• Members distrust the motives of colleagues because they do not understand the roles of other members. Expressions of opinion or disagreement are considered divisive or non supportive.</td>
<td>• Members work in a climate of trust and are encouraged to openly express ideas, opinions, disagreements, and feelings. Questions are welcomed.</td>
</tr>
<tr>
<td>• Members are so cautious about what they say that real understanding is not possible. Game playing may occur, and communication traps may be set to catch the unwary.</td>
<td>• Members practice open and honest communication. They make an effort to understand each other's point of view.</td>
</tr>
<tr>
<td>• Members may receive good training but are limited in applying it to the job by the supervisor or other group member.</td>
<td>• Members are encouraged to develop skills and apply what they learn on the job. They receive the support of the team.</td>
</tr>
<tr>
<td>• Members find themselves in conflict situations which they do not know how to resolve. Their supervisor may put off intervention until serious damage is done.</td>
<td>• Members recognise conflict as a normal aspect of human interaction, but they view such situations as an opportunity for new ideas and creativity. They work to resolve conflict quickly and constructively.</td>
</tr>
<tr>
<td>• Members may or may not participate in decisions affecting the group. Conformity often appears more important than positive results.</td>
<td>• Members participate in decisions that affect the team, but understand that their leader must make a final ruling whenever the team cannot decide or an emergency exists. Positive results, not conformity, are the goal.</td>
</tr>
</tbody>
</table>

The cross-functional team is responsible for projects which cut across more than one functional work area. Membership may be either appointed or voluntary and the team ongoing.

Cross functional teams provide more efficient use of development time by facilitating communication, cross functional cooperation and increasing goal congruence among functional groups (Zirger & Hartley, 1996). Faster development time is achieved by teams with greater functional representation and where members balance fewer simultaneous projects (Zirger & Hartley, 1996).

The task team normally includes people from one or more functional areas and is formed to perform a specific task and then disbanded.

A study by Ancona & Caldwell (1990) of the "formalizing management" activities of the product development team found four distinct sets of activities with other groups.

- **Ambassador Activities** - aimed at protecting the team from interference from others.

- **Task Coordination Activities** - involving communication with functional groups coordinating the team efforts.

- **Scouting Activities** - collecting information about what is happening in the rest of the organisation.

- **Guard Activities** - protecting information and resources from individuals and agencies.
Another study by Barczak & Wilemon (1989) found four roles of the team leader:

- **Communicator** - the leader's effectiveness in communication within the team.
- **Climate Setter** - the environment the leader helps to create for the team to be comfortable in their work.
- **Planner** - the leader must be responsible for developing a plan to guide and direct the team.
- **Interfacer** - the leader's cross functional interaction with other groups in a liaison role.

Lewis and Smith (1994) list four types of teams used in a TQM context to effectively implement Total Quality Improvements.

<table>
<thead>
<tr>
<th>Type of Team</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Team</td>
<td>Responsible for strategic management of the quality process.</td>
</tr>
<tr>
<td>Functional Team</td>
<td>The work group from a single work or functional area. Membership is voluntary and the team continuous.</td>
</tr>
<tr>
<td>Cross-functional Team</td>
<td>Includes people from more than one work area. Responsible for projects which cut across functional lines. Membership is voluntary and the team ongoing.</td>
</tr>
</tbody>
</table>
Task Team

Includes people from more than one work area. Formed to solve specific problems and is then disbanded. Members are selected / seconded based upon their background and experience.

One of the major causes of project failure is neglect of human factors in systems evaluation and development practices (Barlow, 1991). Human resources practitioners have long preached management of the interaction of individuals and groups in the workplace. Effective management of human resources is being increasingly recognised by business as a key to success.

However, organisational politics continue to play major role in project allocation, especially when competing for scarce technical resources with the organisation. Thorough evaluation of the motivation behind proposals, together with the impact of and on the human factor, are suggested in literature as needing decisions to be made based on merit.

The application of human resources to a project is undertaken in varying ways.

Pressman (1992) gives three of the main methods used to today’s project environment:
• Assigning \( x \) individuals to \( y \) functional tasks where relatively little combined work occurs, coordination being the responsibility of the project manager.

• \( x \) individuals are allotted \( y \) different functional tasks (where \( y < x \)) so that informal "teams" are established, coordination again being the responsibility of the project manager.

• \( x \) individuals are organised into \( t \) teams; each assigned one or more functional tasks; each with a specific structure common to all teams working on the project and coordinated by both the team and the project manager.

Of these three methods the third is the most appropriate for a TQM management style while also being considered by Pressman (1992) as the most productive approach.

Manteim (1981) suggests three differing generic team organisations

• **Democratic Decentralized** - Team has no permanent leader. (i.e. differing task leader for differing tasks). Decisions on problems are made by the group with group communications being horizontal.
• **Controlled Decentralized** - Team has a defined leader who coordinates specific tasks. Problem solving requires a group activity but with implementation of solutions allotted among sub-groups by the leader. Communications within the group are horizontal. Vertical communication is through the hierarchical structure of the organisation.

• **Controlled Centralised** - Problem solving and internal team coordination is managed by the team leader. Communication between the leader and the team members is vertical.

Manteim (1981) also describes functions that should be considered when planning the structure of the project team:

- The degree of difficulty involved.
- The lifespan of the team.
- The degree to which problems can be modularized.
- The required quality and reliability of the system to be produced.
- The rigidity of the delivery date.
- The degree of communication required for the project.

He goes on to say that because the centralised structure completes tasks faster, it is the most adept at solving problems.
Decentralized teams, however, do generate far more and better solutions than individuals. Therefore they have a greater probability of success working on complex problems.

The study of literature on differing techniques used to address development team structure leads the author to deduce that the structure of teams is dependent upon a number factors including the management structure of the organisation, the project type, it’s priorities and strategic nature.

10.2 The Individual

While the individual is part of the team his/her primary concern is himself/herself. Individual perceptions of self esteem are extremely important. How the individual interacts with others, especially with those with whom he or she works affects the success of the team. The greater the success of the team the greater the self esteem.

10.3 Interpersonal Relationships

Such is the nature of research and development within the banking industry that technology "consistently forces one person to be dependent upon the other [creating] greater potential for trouble [to] exist"(Cohen, et al, 1988,P255).

However, interpersonal difficulties arise in varying ways within the research & development area.
In the course of a research and development project, interaction occurring between people from different departments are impacted upon by the demands made by the individual department management.

11. ACCELERATED DEVELOPMENT

There is a trend to focus not on financial success but rather specifically on the speed of development (Cordero, 1991; Mabert et al., 1992).

Business systems are introduced to improve an organisation’s ability to compete in the marketplace. Folkes & Stubenvol, (1992) suggest that speed at which systems are developed determines the business benefits to be gained. This may be achieved by shortening one or more steps in the Systems Development Life Cycle (SDLC) as described below:

**Inception:**
- Shorten inception by gaining agreement through improved communication and by narrowing the scope.

**Definition:**
- Shorten the definition by improving communication and mutual understanding using tools understood by users and developers alike.

**Design:**
- Shorten design by dividing the project into components.
Construction:

- Shorten construction by re-using existing facilities and code.

Clark & Wheelwright (1993) maintain that speed in development is rooted in the ability to solve problems quickly and to integrate insight and understanding from the business with critical pieces of knowledge on the technical side.

Time saving options additionally proposed by Clark & Wheelwright (1993) between initiating development of the system and gaining its benefits include:

- Increasing resources.
- Carry out steps in parallel.
- Reuse existing facilities.
- Incorporate labour-saving features in early steps which re-use the work in later steps.
- Change the System Development Life Cycle (SDLC).

By implementing a shorter SDLC, a TQM company can:

- gain the advantage of having a more productive development team. It is easier to retain a "critical mass" of creativity with shorter projects than with more protracted ones.
• use additional time to obtain feedback prior to commencing development allowing for a more accurate definition of customer requirements. The resulting specified customer needs at the beginning of the development cycle are more up to date.

• attain the ability to exploit technology developments and bring them to the market faster than the competitor.

A poll by Gupta and Wilemon (1990) of eighty executives for factors that slowed or accelerated the development process identified the following:

• internal organisation,
• cross-functional customer and supplier involvement,
• visible top management support,
• available resources, and
• teamwork.

Zirger & Hartley (1996), in a study on the effect of Accelerated techniques on product development time, found that six techniques were significantly related to development time performance. The four with a positive correlation were:

• Employment of cross functional teams decreases development time by facilitating cooperation and communication across functional groups.
• The use of team members dedicated to the project was more productive than employing members assigned to more than two projects.

• The overlapping of development activities enhanced information processing within the project.

• The use of time as a goal was seen having a significant impact on development time. The authors do emphasize, however, that using this technique time is given a higher priority than product performance, quality & costs.

The question is raised, however, as to whether a project, where measurement of the success of based on time to completion, can be considered a Quality project.

12. PROJECT CENTRALIZATION v DECENTRALIZATION

"Centralization makes it possible to concentrate research on strategic projects required to adapt to large changes in the environment", (International Journal of Technology Management, 1991, P67), which in turn will result in a change in the culture of the organisation.

Centralization of project teams can speed development by facilitating communication and decision making (Shaw, 1976; Takeuchi & Nonaka, 1986; Zangwill, 1993).

Zirger & Hartley (1996), however found that co-location of project teams did not significantly reduce development times.
The physical layout of the working environment within the research and development area impacts upon the productivity of the unit.

"To the extent that two groups maintain a close physical proximity on a day-to-day basis, interactions....will enhance inter-group cooperation" (Cohen, et al, 1988, p.399) and "the more frequent the interaction between any two groups, the greater the tendency to cooperate with each other" (Cohen, et al, 1988, p.393).

Work space constraints may, however, preclude the central location of research and development staff. This can cause some problems with communication between members of the development team.

For example, where business analysts are located remotely from technical analysts, misinterpretation of requirements results in the need for rework while effecting the cohesion of the team.
13. PROJECT SUCCESS

A 1990 survey (Krajewski & Ritzman, 1992) of US manufacturing executives on the importance of each competitive force resulted in ratings as follows:

<table>
<thead>
<tr>
<th>Competitive Force</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-time Delivery</td>
<td>.58</td>
</tr>
<tr>
<td>Consistent Quality</td>
<td>.56</td>
</tr>
<tr>
<td>High Performance Design</td>
<td>.25</td>
</tr>
<tr>
<td>Fast Delivery</td>
<td>-.06</td>
</tr>
<tr>
<td>Development Speed</td>
<td>-.27</td>
</tr>
<tr>
<td>Customisation</td>
<td>-.29</td>
</tr>
<tr>
<td>Price</td>
<td>-.03</td>
</tr>
<tr>
<td>Volume Flexibility</td>
<td>-.71</td>
</tr>
</tbody>
</table>

1.0 = More Important    -1.0 = Less Important

Examination of these ratings indicates that, in the real world, delivery deadlines are a major yardstick by which the majority of US executives measure project success. Tippett and Wait (1994) found that, faced with upper management’s continued narrow concentration on cost, schedule and performance, American project managers generally respond by focusing on achieving project success strictly in those terms.

Zirger & Maidique (1990), in a study of 86 success/failed projects found that success was measured by whether senior management considered the product to be a business profit or loss contributor.

Wateridge (1995) quotes a recent survey as indicating that twice as many IT projects are considered 'less successful' than successful.
14. PROJECT FAILURE

Projects fail for many reasons. Frame (1991), for instance, lists the reasons that projects fail as arising from three major sources:

- **Organisational factors** - Project managers are given the responsibility to carry out the project, but with little or no authority.

  Success of a project is largely the result of firstly the project manager's ability to coordinate and influence relevant parties, and secondly their willingness to cooperate.

- **User requirements being poorly identified and specified** - Even though the project may be completed on time and under budget, if the end product is something that is not utilized or grossly under utilized then the project can be deemed as a failure.

- **Poor planning and control** - The failure to plan for contingencies and failure to keep track of whether or not tasks have been completed on time is a source of project failure.

Projects may fail because they are under funded, because the original concept was flawed or simply too large and complex. Projects involving the development of business systems can additionally fail because the choice of software tools or hardware platform was wrong, or due to delivery of a system which is already obsolete.
A survey by Gladden (1982) of 200 organisations in the United States showed that the typical project was delivered one year late and 100% over budget and that 25% of projects were never delivered at all.

Also DeMarco (1982) estimated that 55% of the total effort in developing a business system was made after implementation, correcting errors and making changes.

Since then various surveys comparing maintenance effort in new development have estimated figures from 60% to 85%. According to Holloway (1989) many organisations have a backlog of two to five years with requirements varying from small enhancements to large systems.

In 1988 a survey by Price Waterhouse found that British industry was losing over £500 million per year through ineffective software development.

The following year interviews of a number of staff of Information System departments in the UK by Computer Weekly found 72% worked for organisations who employed no formal quality control procedures.

Figure 4 shows a comparison of characteristics found in effective and ineffective projects.
### Figure 4 CHARACTERISTICS OF PROJECTS

<table>
<thead>
<tr>
<th>INEFFECTIVE PROJECTS</th>
<th>EFFECTIVE PROJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristic</strong></td>
<td><strong>Consequence</strong></td>
</tr>
<tr>
<td>Multiple, ambiguous objectives</td>
<td>Long planning stage; trouble reaching consensus, conflicts.</td>
</tr>
<tr>
<td>Narrow focus on easily identifiable requirements.</td>
<td>Late design changes; product mismatch; late delivery</td>
</tr>
<tr>
<td>Focus on aesthetics of solutions; little concern with time and costs.</td>
<td>Slippage in project time frames; schedule compression to meet deadlines.</td>
</tr>
<tr>
<td>Reliance on post release maintenance to fix problems.</td>
<td>Poor, ineffective prototypes; many late changes; lower than expected returns.</td>
</tr>
<tr>
<td>Narrow band of specialist skills</td>
<td>Misconception of requirements; lack of skills leading to misdirected effort; ineffective use of time and resources.</td>
</tr>
<tr>
<td>Unclear direction; accountability limited; vague areas of responsibility</td>
<td>Lack of coherent, shared vision of the project concept; &quot;us versus them&quot; mentality.</td>
</tr>
</tbody>
</table>

A project which does not deliver the following outputs can be classed as a failure:

**Dependability**

- Delivery on time is rated by business (Krajewski & Ritzman, 1992; PEP, 1994) as being more important than any other function.

**Productivity**

- A project must be able to deliver the increases in productivity expected by the business.

**Value**

- Return on investment is a major requirement in strategic projects.

**Integration**

- Integration of developed systems with existing business practices is critical to the success of a project.

15. SUMMARY OF CONVENTIONAL PROJECTS

Historically projects have been initiated by management. The perceived return on investment through the ability to quickly deliver a competitive edge to the market is often the main organisational benefit considered in a management initiated project.
The conventional project model observes the following basic linear pathway:

- A need is perceived and from this idea a basic concept is developed.

- Dependent upon the strategic significance of the proposed project it is prioritized and analysed to ascertain its cost benefit. Quantitative costings and perceived dollar benefits are submitted to senior management for project consideration, normally based upon managerial judgment, and approval.

- Once approval is forthcoming, detailed specifications of requirements are obtained before commitment of further resources to the project.

- A project team is established, project deliverables identified and project plans prepared.

- Engineering of the project is undertaken.

- Production of the project is undertaken.

- The project is completed with delivery of the end product.

Authors agree that requirements definition play a major part in the success of a project.

As rigid requirements are easier to deliver than constantly changing ones quality of the final product is often secondary to delivery on time and within budget.
Projects for the manufacturing and construction industries enable the requirements of the project to be specified at the outset. However, in the case of a service industry project (e.g. involving the development of a process or business system), detailed requirements are unknown at the outset of the project.

Early service industry projects aimed at introducing systems to cut costs did not focus on the human factors affected. There is therefore a shortfall in successful implementation of the traditional project model to service industry projects.

Project management techniques have continued to evolve and today’s conventional projects include a mixture of traditional and quality focused techniques with a trend towards adopting a customer focus across industry generally.

16. QUALITY PHILOSOPHIES

The primary management goal of TQM implementation should always be improving quality. Productivity and profitability will naturally increase as a result of improvement in quality and therefore they should not be included as primary management goals (Juran, 1962; Crosby, 1980; Deming, 1982; Imai, 1986).

Webster's Dictionary (1982) defines quality as "that which makes a thing what it is; nature; kind or degree of goodness or worth; attributes; degree of excellence....".
However, while comprehensive, this definition does not resolve the differing perceptions of quality which the producer and the customer hold.

The American Society of Quality and Reliability defines quality as the totality of features and characteristics of a product or service that bear on its ability to satisfy given needs.

Quality is associated with the term "fitness for use" which can be interpreted to mean the output which satisfies the customer. A key philosophy of TQM is that quality is determined by the customer, not those involved in the production of the output or those involved in marketing it. Quality is based on the customers' actual experiences with the produced output measured against the customers requirements (Imai, 1986).

Accordingly, TQM literature emphasises the need for management to preside over quality planning, control and improvements systems to ensure the intended functions of the output are achieved with the greatest overall economy or in other words ensure a "quality function" is in place.

16.1 Kaizen Strategy

Kaizen, when applied to the workplace, means continuous improvement involving everyone - management and workers alike.
The Kaizen strategy is described by Masaaki Imai (1986) as the single most important concept in Japanese management and a key to their competitive success. Though the concept was originally uniquely Japanese it is now being embraced by Western cultures.

Under the umbrella concept of Kaizen fall a number of practices which have achieved world wide fame. Those of these which can be used in relation to development projects include:

16.1.1 Customer Orientation

Customer orientation is a cornerstone of the Kaizen philosophy. Each stage in any process is viewed as both being a customer of the previous stage and having a customer at the next stage of the process. This promotes an awareness of the need to fix problems at the source rather than pass them on (Imai, 1986).

Each step in the process is aimed at adding value in such a way that the final product achieves the characteristics reflecting the final customer's definition of requirements.

A Study by Myers & Marquis (1969) of development of 567 successful products and processes in 100 firms covering five industries found that identification of customer needs was substantially more important to the success of the product than technology.
16.1.2 Total Quality Control

The main thrust of TQC is the instilling of a quality consciousness in people and is one of the building blocks in establishing a TQM culture. TQC refers to organised Kaizen activities, applying equally to manufacturing and service industries, and involving everyone in the organisation, from the Chief Executive Officer to the most junior employee, in a totally integrated effort to improve performance at all levels.

These undertakings include directing efforts towards project management, cross-functional aspects of cost, scheduling, new product development and human resources management.

The instilling of a quality awareness in employees of the organisation is an important human resources management objective of the Kaizen strategy.

16.1.3 Robotics and Automation

Implementation of quality automated systems lead to the reduction in variability inherent in any human involvement process.

Use of automated testing techniques in development of a business system reduces the variation inherent in the manual process.

However this is not to say that use of robotics / automation will produce a product which is necessarily closer to customer specifications.
Effective management of automation of any process is necessary to ensure that variation from specifications is minimized.

16.1.4 Quality Control Circles

Small group activities performing quality control activities in the workplace on a voluntary basis is the focus of this Kaizen strategy. The use of various statistical and brainstorming tools are employed to selectively identify quality improvement opportunities. Quality Control Circles ensures that there is an organisational culture in place of employing quality improvement techniques on a permanent and on-going basis (Imai, 1986).

However, though successful in some businesses, Quality Circles have a high failure rate in the United States. The main problem appears that they are seen as an additional task to be undertaken (Cotton, 1993). Brown and Eisenhardt (1995) suggest that cultural differences between Japanese and Western society may be a contributing factor here.

16.1.5 Suggestion Systems

The Kaizen philosophy uses suggestion systems as a method of improving the process by tapping the knowledge of every employee, particularly those closest to the process. Suggestion schemes are currently in operation at most large Japanese manufacturing companies (Imai, 1986).
In many instances in Western businesses the skilled operator has been long aware of solutions to quality problems, but has never been asked by management for his or her input. This seemingly simple management feedback tool has allowed Japanese businesses to more effectively use the corporate knowledge base than their Western counterparts.

16.1.6 Total Productive Maintenance

TPM is directed at maximizing equipment effectiveness throughout the entire life of the equipment by the use of preventative maintenance.

Conduct of preventative maintenance on development tools is essential to ensure the quality of the development process.

The introduction of TPM at Topy Industries’ Ayase Works in Japan in 1980 resulted in marked increases in productivity and cost reductions (Imai, 1986).

16.1.7 Just in Time

The concept of 'Just-in-Time' refers to the delivery of an exact number of units required for each successive stage of a process being bought to the production line at the appropriate time during the production process.

First employed by the Toyota Motor Corporation to minimize inventory and thus cut waste (Imai, 1986), where employed in a project context (Krajewski & Ritzman, 1992), Just-in-Time can reduce costs resulting in:
• Less wasted time for work in progress.
• Less waste in motion.
• Reduced storage facilities.
• Reduced inventory of raw materials by later delivery.
• More effective use of human resources (when applied to timing of skill requirements).

16.1.8 Zero Defects

Though the philosophy behind Zero Defects is a practical impossibility in the development environment, the Zero defects strategy is to relentlessly pursue a decrease in variability and thus in defective output.

In a project environment, minimizing defects will save or optimise development costs and time frames.

16.1.9 Small Group Activities

Unlike Quality Circles, small group activities exist only for the duration of an improvement task.

Small groups are informal gatherings which are voluntary and task oriented. The flexibility of Small Groups allows for the range of tasks undertaken to similarly be flexible.

For a project, this flexibility allows problems to be addressed on a 'needs' basis with minimum resourcing and maximum employee involvement.
16.1.10 Co-operative Labour - Management Relations

In the Kaizen based Labour - Management Relationships (Imai, 1986, P165) the two party system of management and labour is replaced by a mutual cross-functional attitude to solving labour problems.

It is important that the organisation creates a bridge between management and labour so that all efforts are directed towards the common goal.

Success in establishing a quality culture relies upon a positive Labour-Management relationship.

16.1.11 Productivity Improvements

The key to improved productivity is the implementation of the TQM strategy of working smarter, not harder.

The implementation of a quality training strategy and incorporation of a philosophy of empowering the employee are ways to improve productivity.

Productivity improvements, however, can be threatened by staff down sizing as a result of restructuring activities, such as those undertaken in the finance industry over the past five years.
16.1.12 New Product Development

The Kaizen strategy of incremental improvement requires the ability of an organisation to employ new tools of improvement. Technology advances need to be integrated into the business to enable growth (Krajewski & Ritzman, 1992).

Using new technology enhancement of existing products can lead to development of new ones. Innovative ideas, while of a higher risk factor have the potential to expand the market base.

Kaizen strategies when applied to the methodologies used in new product development can greatly enhance the ability to successfully implement change involving innovation.

16.2 Force Field Analysis

Force field analysis provides a technique for analysing and solving complex problems. Its use helps to improve problem solving and training skills and increases creativity and influence.

First described by Kurt Lewin, the method involves identifying the forces resisting and driving change (See Figure 5).
First, the forces on both sides are identified. Then they are weighed in terms of the amount of force they exert. When the various forces are seen in this graphical display there is a better chance of controlling them.

It is a very useful tool in analysing and solving problems associated with a business system development project.

**Figure 5 FORCE FIELD ANALYSIS**

```
Resisting Forces                      Resisting Change
↓  ↓  ↓  ↓
↓  ↓  ↓  ↓
↓  ↓  ↓  ↓
↓  ↓  ↓  ↓

Driving Forces                       Prompting Change
↑  ↑  ↑  ↑
↑  ↑  ↑  ↑
↑  ↑  ↑  ↑
↑  ↑  ↑  ↑
```

16.3 Taguchi Methods

"Quality losses must be defined as deviation from target, not conformance to arbitrary specifications" (Gunter, 1987).
Arndt (1991) describes Genichi Taguchi's Quality philosophy as covering the relationship between the quality of a product / process and the total loss created by that product / process to society.

The basic elements of this philosophy are:

- The total loss to society created by variations in the quality of a product / service is an important dimension of Quality.
- In today's competitive environment continuous quality improvement linked with cost reductions are vital to remaining in business.
- Continuous quality improvement reduces variation in the product / process, thus creating stability.
- The cost of quality is determined to a large extent by the quality of design of a product / process and method of production / delivery.
- The use of experimental design enables identification of settings required to reduce performance variations of product / process parameters.
- Quality strategies need to include the whole project life cycle, beginning with planning, through development, implementation / installation to post project support.
16.3.1 Project Variability

Factors causing variability in the project can be attributed to three main types of noise [Arndt(1991):

- EXTERNAL NOISE - temperature, dust, human differences. The working environment of the project team have a bearing upon its productivity as do the health and stability of the team.

- INTERNAL NOISE - physical deterioration of machinery, etc.

- VARIATIONAL NOISE - differences between individual like products/processes of the same specifications.

16.3.2 Stages of Quality Design

According to Tillery and Rutledge (1991) there are two important links between quality and strategy: design and conformance to design.

All outputs from the process must reflect strategic decisions while being in line with customer requirements to ensure fitness for use (Tillery and Rutledge, 1991). However design does not stop at the process level. Changes in market perceptions, new technologies and competitor moves all form part of considerations of requirements. Accordingly, quality design and planning needs to consider the effects of internal and external forces on the process.
Achieving high quality levels economically requires quality to be designed into the product / process.

According to Arndt (1991) the three Taguchi stages of quality by design are system (or functional) design, parameter (or targeting) design and tolerance (or allowance) design.

16.3.2.1 System Design

Examining the system design involves the establishment of the basic technical concept of the functions of the product / process being developed in order to define the initial setting of the product / process design characteristics.

16.3.2.2 Parameter Design

The parameter design involves ensuring the functionality of the layout of the design. This enables maximum performance while minimizing cost.

Analysis of the current set up, where available, enables comparison of old and new. This comparison allows both relative costing to be made and the establishment of a "best method" (Arndt, 1991).

Timings of existing and prototype layouts enables performance variations to be charted.
16.3.2.3 Tolerance Design

The tolerance design requires covering the variation in people using the product/process (e.g. varying experience, abilities and skills of employees).

16.4 Quality Functional Deployment

Quality Functional Deployment (QFD) is a systematic way of converting customer requirements into quality characteristics of design to ensure that the quality defined by the customer is built into the system to enable deployment into the finished product (Dale & Plunkett, 1990; Sarkis & Liles, 1995).

The requirements supplied in the customer's own language (A) are translated into true quality characteristics (B) (e.g. "looks nice" in the customer's words = "aesthetics" in designer's words).

The (B) characteristics are then translated into design characteristics (C), which in turn are translated into manufacturing characteristics (D) and so on until characteristics are deployed throughout the system.

Quality Function Deployment is in fact a highly effective communication tool which enables the specifications of the customer to be correctly interpreted throughout the organisation into the language of those dealing with the process of delivering required quality. By definition it is therefore an essential tool in producing quality project deliverables.
16.5 Quality Costs

The major motivator with regards to TQM for most managers (Fox, 1993) is the cost reduction opportunities which are identified as a result of quality cost analysis. This usually occurs at an early stage of education of senior management and can often signal a significant shift in the attitude regarding the importance of quality.

Quality must, however, be defined in much broader terms than the traditional cost based view. "Meeting customer requirements" is one such definition enabling focus on quality to be applied throughout the organisation.
Deming (1982) and others maintain that the cost of waste and error is around 30% of the total cost of goods and services and can represent, for many companies, the difference between success and failure.

However, the benefits of improved quality are sometimes very difficult, if not impossible, to measure directly. The real costs of current quality control and assurance are also difficult to measure.

Using the fundamental principle that improved quality leads to reduced costs by a reduction in waste and error, the concept of "Cost of Quality" is being used to draw attention to the financial impact of quality control and quality improvement (Evans & Lindsay, 1993; Gehani, 1993; Jereb, 1986; Singh, 1993).

In its application the following is emphasized;

- The "unquantifiable costs" of quality (e.g. cost of lost customers, impact of unfavorable word-of-mouth reports to potential customers, etc.) may far outweigh the identifiable costs, and

- A too heavy emphasis on the "quantifiable costs" of quality can deter management from making the essentially right long term decision simply because the identifiable monetary gains do not appear to justify it.
The "Cost of Quality" covers three sub-costs:

- Failure Costs
- Appraisal Costs
- Prevention Costs

16.5.1 Failure Costs

Failure costs are those incurred because a product or service fails to achieve the quality required and can be further broken down into internal and external failure costs (Evans & Lindsay, 1993; Gehani, 1993).

16.5.1.1 Internal

These refer to the costs incurred before the product or service reaches the market. In the case of a project internal failure costs are extensive and include: design failure, rework due to design changes, action to correct or amend the design, purchase of incorrect materials, corrective action with suppliers, re-inspection and re-test costs, etc.

16.5.1.2 External

These costs relate to those incurred after the customer receives the product or service and include: investigation of customer complaints, recall costs, loss of customer goodwill, maintenance of complaints department, retro-fit costs, etc.
### 16.5.2 Appraisal Costs

These are the costs of appraising a product or service in an endeavor to ensure delivery of required quality. They include management time, inspection and control programs, inspection reporting, evaluation costs, laboratory testing, maintenance and calibration of equipment, etc.

### 16.5.3 Prevention Costs

The majority of these costs can be regarded as an investment in quality rather than a cost. They are activities designed to ensure that the project deliverables of the product or service meet customer requirements, prevent failure costs and unnecessary appraisal costs, etc.

The costs include market research, user training, document review, design costs to prevent failure, supplier review activities, measurement and control equipment, quality performance reporting and Quality Audits, etc.

Three fundamental principles should guide the approach to Quality Costs:

- Investment in quality improvements leads to reduced costs, increased productivity and a long term competitive advantage.
- The incidence of cost of inspection must be reduced, and
• The process must be got "right" at every stage, particularly at the design stage, to reduce waste and error.

Quality improvement should therefore imply a move away from failure and appraisal costs towards prevention costs.

16.6 Quality Assurance Commitment

In view of the integral part Quality Assurance plays in the implementation and continuation of TQM, it is considered by some that all functions of Quality Assurance should be located under the one administrative umbrella with formal direct access to senior management. This is seen as becoming even more necessary as TQM spreads throughout the whole of the organisation (Busbe, 1988; Cantello et al., 1990; Krajewski & Ritzman, 1992; Evans & Lindsay, 1993; Waterman, 1994).

The roles of Quality Assurance in the implementation of the successful project include the following:

• Formalized Quality Assurance checks to ensure the application developed meets defined and measurable Quality standards and identifies end user requirements.

• The development of skills including the use of the seven basic statistical tools for measurement and analysis of developing applications.
• Establishment, maintenance and upgrading of standards constantly.

• Testing of conformance to specifications, system testing and measurement, analysis and reporting of end user evaluation of applications under development.

• Conduct of post implementation reviews and reporting of results and recommendations to management and development teams.

16.7 Supplier Relations

The fourth of Deming's 14 points of management calls for an end to the practice of awarding business based on price. The establishment of a single supplier relationship for any one item is seen as a method of founding a long term alliance of loyalty and trust which will minimize long term total costs.

In an environment which develops business systems using the latest technology the strength of the relationship with hardware and software suppliers is critical to the success of the project.

A study by Zirger & Hartley (1996) however found that, contrary to the expectations of proponents of accelerated development, decreasing the number of suppliers was related significantly to slower project completion times.
16.8 PDCA Cycle

The "Deming Wheel" (Imai, 1986, P11) has several variations, but the most commonly used one is the PDCA cycle. Plan, Do, Check, Act is a continuous problem solving cycle used in small step improvements. The continuity of the cycle makes it a tool for continuous improvement within the philosophy of Total Quality Management.

16.8.1 Plan

The first part of the cycle has four sub-phases.

- Select the target for improvement.
- Identify the problem / opportunity and the expected result.
- Analyse the present situation.
- Analyse the cause and effect of this situation and plan remedial action.

The definition of this step is critical to the success of any project.

16.8.2 Do

This stage involves the execution of the plan /project.

16.8.3 Check

This stage involves confirmation of the results of the execution by comparison of the targeted results with the actual ones to ascertain the value of those results.
16.8.4 Act

The final stage involves two sub-phases:

- Taking action to prevent recurrences of problems by standardisation of steps.
- Identification and prioritization of remaining problems to reflect in planning stage of the next PDCA cycle.

16.9 Total Employee Involvement

Total Employee Involvement (Arndt, 1991) is a Japanese management philosophy which seeks to empower each employee to be responsible for his own quality output levels. The stages of implementation are:

16.9.1 Participation & Involvement

Management encourages workers to supply feedback by making suggestions on improving their part of the process.

This in turn initiates a procedure whereby employees begin to accept responsibility for their own actions and are able to recognise their importance in the overall process.

16.9.2 Development and Education

Training and development of employees is undertaken to meet the needs of increasing self-management activities thus ensuring employees are able to handle empowerment.
16.9.3 Effect & Economic Benefits

The rewarding of employees for their increased involvement in the company is undertaken by passing on part of the savings made as an encouragement for future involvement and improvements.

16.10 Value Added Management

Value Added Management (VAM) is one of the cornerstones of the Australian Technology Transfer Council approach (Arndt, 1991).

It is a strategy of continual improvement through identification and elimination of all non-value adding and non-service adding waste through the total involvement of all employees.

VAM is the "how" part of an organisation's strategy and important to the successful implementation of a project strategy. It has four sub-strategies: manufacturing, products, marketing and finance.

Its use in the project environment allows for identification of non-value adding activities at each stage of development thus enabling reduction in waste.

16.11 Visible Improvement Management

VIM is a management technique based on both Deming's "Management By Walking Around" (MBWA) - and the Japanese "Going to Gemba" philosophy, extended to the use of quality improvement tools to visually and graphically display the operations of the process / organisation.
Visual display in the workplace of problems encourages input to solutions by all (Imai, 1986).

**16.12 Value Analysis**

Product design is the root of the value adding process. Known as Value Engineering at the design stage of development Value Analysis involves differentiating between VALUE and COST.

Whereas actual cost of implementation can be readily calculated the value of the change, being less tangible, involves subjective deduction of the perceived cost savings.

Value Analysis is concerned not only with reduction in cost but with the alternative possibility of increasing product worth while keeping product costs constant.

It allows identification of the benefits of a proposed project to weighed against any detrimental attributes.

Once the area targeted for improvement has been identified, data on the existing set-up must be obtained to enable definition of the problem(s).

Dale & Plunkett (1990) suggest the Value Analysis team to undertake value analysis should be comprised of six to eight people with the make up being recruited based on their expertise and open mindedness rather than status. They should be chosen from planning, research, design & development, marketing, purchasing, service and installation and quality.
The technique (Author anonymous) involves six main stages:

- **Information gathering stage** - defining the product to be analysed, what it does, and what it costs.
- **Analytical stage** - conduct of a critical examination as to what it is able to do and what should it cost.
- **Creative Phase** - looking at alternatives in creation of ideas on improvements to perform the task better.
- **Evaluation Phase** - Analysing and evaluating what it will do, what it will costs and what are the risks involved.
- **Investigation Phase** - identifying the following specifics:
  - who will approve the project,
  - who will fund the project,
  - who will undertake the project,
  - the location to be used for the project,
  - the resource(s) responsible for monitoring the project, and
  - who will determine priorities.
- **Recommendations Phase** - documentation of the best alternatives and recommendation to include motivation for action.
Substantial savings and improved quality have been recorded in studies of American industry employing an approach centred around the combination of Quality Teams and Value Analysis (Krajewski & Ritzman, 1992; Evans & Lindsay, 1993; Waterman, 1994).

**16.13 The Customer**

The TQM philosophy involves focusing on customer satisfaction in implementing continuous improvement.

The TQM philosophy that "the next step is the customer" acknowledges that the need to satisfy the internal customer must first be recognised so that the external customer's requirements may be addressed.

The internal supplier-customer relationship is driven by the need to align the provision of customer service with the objectives of customer satisfaction.

The provision of the tools of quality to employees throughout the organisation enables the provision of a quality service to the external customer.

Constructive criticism of poor customer service quality is encouraged and accepted in a TQM organisation (Gehani, 1993).

Each level of the TQM organisation recognises and know who their customers are, both directly and indirectly.

Co-ordination of change which affects customer satisfaction ensures input from all stakeholders in the process.
16.14 Summary of Quality Philosophies

In the ever changing business world of today the customer is increasingly demanding quality in product and process.

The implementation of quality philosophies in the completion of projects ensures that these demands are met.

Quality philosophies effect the viability of any business venture. Whether seeking a competitive edge, success in a project, or simply seeking to survive the use of various quality philosophies will enhance the performance required.

The full benefits of TQM can be achieved only if the principles and practices are applied throughout the organisation rather than just within isolated departments.

The establishment of a quality chain passing through every individual employee (who is both the provider and the customer of service) to the ultimate external customer provides a focus for all quality improvement efforts and ensures that they are coherent.

It must be stated though, that TQM philosophies rely extensively on the Japanese viewpoint. Brown and Eisenhardt, (1995) noted that whether certain features are relevant to project management in the development of business systems or simply part of the Japanese culture is sometimes unclear.
In addition inconsistent findings have been made on the effect of supplier involvement in accelerated development (Gupta & Wilemon, 1990; Clark & Fujimoto, 1991; Imai et al., 1985; as against Zirger & Hartley, 1996).

17. QUALITY TOOLS

There are seven basic (B7) statistical and seven new (N7) management tools (Imai, 1986; Arndt, 1991) which are used for analytical problem solving in a project environment.

17.1 The 7 Basic Tools

17.1.1 Histograms

Histograms are a collection of data, displayed in graphical form enabling the shape, central value and manner of dispersion to be noted.

In project management histograms are used to identify variations in the processes in use.

17.1.2 Cause and Effect Diagram

The Cause & Effect (or fishbone) diagram is used to analyse the causal factors of process variation.

Well constructed cause & effect diagrams enable relationships between causal factors to be established.

The use of Cause & Effect diagrams in the project management environment allows analysis of problems to be undertaken during all stages of development.
17.1.3 Check Sheets

Check Sheets are tools to simplify collection of data. Their main functions are as a check on defects, a check on the production process and as a confirmatory check. They are used in the project environment to ensure that specifications are being met. Test plans drawn up as check sheets are used to validate workings of components of a project.

17.1.4 Pareto Diagrams

The Pareto diagram is an important tool in the development process. It allows for everyone to identify at a glance the most common occurrence of problems within the process.

It also reveals if attempts to improve the process are successful. If effective measures have been taken the diagram shows a horizontal axis shift with previous secondary causes becoming the primary cause.

17.1.5 Graphs

Bar graphs provide a useful visual display of available resources in the planning of a project.

They enable the project manager to ensure that resources are not over allocated, while indicating any slack in the project.
17.1.6 Control Charts

Control charts display variation in the process and identify causes of that variation. Removal of these causes allow for control of the process to be established.

During prototyping control charts are used to identify variation caused by design flaws thus enabling changes to be made during the development cycle.

17.1.7 Scatter Diagrams

Scatter diagrams are used to statistically indicate correlation between causes of variation in a process. Their use in a project environment, in conjunction with Cause & Effect diagrams, allows for identification of the interaction of both technical and human variation.

17.2 The 7 New Tools

17.2.1 Relations Diagram

A multi dimensional fishbone diagram, the Relations diagram shows the interrelations of various causes and effects to enable easier identification of contributing factors for analysis of complex problems. In a project environment this enables decisions to be made on the most important factors effecting the quality of the developing system.
17.2.2 Affinity Diagram

The Affinity or KJ method is used for brainstorming in the collection of ideas in order to clarify problems in areas where there is little or no prior knowledge.

This is a very handy tool when used in a project developing leading edge technology.

17.2.3 Tree Diagram

The Tree or Systematic diagram lists the most appropriate and effective means of accomplishing given objectives.

Its use in analysing the current situation assists in deciding the method of producing the desired results of the project.

17.2.4 Matrix Diagram

This diagram identifies corresponding elements involved in a process and arranges them to show the presence or absence of relationships. It is a very useful tool when attempting to identify all requirements of a system for development.

17.2.5 Matrix Data Analysis Diagram

This is a technique for quantifying and arranging matrix diagram data so that the information is easy to visualize and comprehend. In project management planning the ability to quantify data is imperative.
17.2.6 Process Decision Program Chart

The PDPC chart helps to determine the order of processes required to obtain the desired results by evaluating the variety of possible outcomes.

The use of this chart assists in avoiding unexpected developments within a project.

17.2.7 Arrow Diagram

Often used in PERT and Critical Path methods it shows the necessary steps in network form to implement a plan.

18. QUALITY STANDARDS

The effect of Quality Standards on perceptions of quality may be as profound as that of the Total Quality Management movement. The International Standards Organisation (ISO) 9000 series is a set of international standards for quality assurance (Standards Association of Australia equivalent AS9000 series).

Australian Standard 3904 (1987, P6) defines a Quality System as the organisational structure, responsibilities, procedures, processes and resources for implementing quality management.

Four fundamentals about Quality Standards are:

- They must make money for the organisation.
- It is important to focus first on the ISO/AS System elements that will make a difference to the organisation's customers and to its profits.
• The organisation needs to allocate adequate resources and treat ISO/AS registration with project management skills.

• The organisation should understand what its market requires, re-engineer its systems to meet those needs efficiently, and make sure it meets the requirements of ISO/AS. There is no long-term or profit-enhancing benefit to ISO/AS if it is not aligned with customer satisfaction and is not designed to give operating cost leadership.

A quality improvement program without an implementation strategy is unlikely to produce the desired results (Stamatis, 1994). It is suggested that in order for a quality program to be implemented with the desired success, a project management approach must be instituted throughout the organisation. Project management brings together and optimizes all variables rather than maximizing any one single variable. The resources that are optimized include skills, talents, cooperative efforts of teams, facilities, tools, information, money, techniques, systems, and equipment.

Since the implementation process of total quality management is defined as a project, the allocation of the resources in an organisation is of importance and therefore the appropriate tool for such a task is the project management approach.
A project with deliverables of an internal nature may not be, on the surface, adversely effected by failure to follow quality standard guidelines.

However, especially when technology is involved, failure of components to a system to conform to industry standards may result in incompatibility with other systems. The risks of non-conformity must be closely weighed against possible added costs.

19. THE NEW QUALITY MODEL

Though conventional project management has served mankind well its deficiency is that it fails to focus on the importance of the customer. There are several arguments central to developing a new approach to this discipline (Frame, 1994; Fox, 1993):

- Project Management must become more customer focused,
- It must employ new management tools,
- It must redefine the role of project managers, giving them more power to operate effectively,
- to effectively solve quality problems,
- to demonstrate the value of the TQM concept,
- to promote the principle of achievement through teamwork,
- to provide management with the means to guide the quality improvement process; and
to create opportunities for people to use the TQM tools.

In Figure 6 a quality model is proposed for introduction of TQM to the field of project management within the banking industry.

This model, expanded upon in this chapter incorporates the following key aspects:

- Total commitment from top management as an essential prerequisite for the implementation of successful quality projects which must be in line with the strategic objectives of the bank (Evans & Lindsay, 1993; Beckhardt & Pritchard, 1992).

- Quality goals to be determined. They must be clear, challenging and attainable and must communicated to all parts of the organisation (Gehani, 1993).

- Adopting a customer oriented approach. This is competitive necessity for survival of banks in the future. The strategic objective of projects must focus on delivering quality as defined by the customer (Sarkis & Liles, 1995; Russell-Hodge, 1995). Customer satisfaction must thus be recognised as the main goal of any project.

- Measurement of the processes used in attaining the goals of a project must be undertaken and used to manage the project.
QUALITY PLANNING
- STRATEGIC PLANNING
- CUSTOMER FOCUS
- COMPETITIVE RANKING
- PROJECT IDENTIFICATION
- VALUE ANALYSIS
- PROJECT PRIORITISATION and APPROVAL
- RESOURCE ALLOCATION
- ATTAINABLE TARGETS
- SKILLS TRAINING
- EMPOWERMENT
- EMPLOYEE INVOLVEMENT

QUALITY DESIGN
- DESIGN PHASE
- CLEAR DOCUMENTATION
- QUALITY FUNCTION DEPLOYMENT
- DEVELOPMENT STANDARDS
- QUALITY TOOLS
- TRAINING REQUIREMENTS
- SYSTEM LIMITATIONS
- STAKEHOLDER INVOLVEMENT
- SUPPLIER INVOLVEMENT
- USER INVOLVEMENT
- CROSS-FUNCTIONAL RELATIONSHIPS
- SUPPLIER RELATIONSHIPS
- SERVICE AGREEMENTS
- PDCA CYCLE
- REPORTING
- TIME MANAGEMENT
- TRACKING TOOLS
- PROJECT REVIEW
- RELATIONSHIP MANAGEMENT
- PROJECT CONTROL

QUALITY DEVELOPMENT
- DEVELOPMENT PHASE
- PILOTING
- FEEDBACK
- PRODUCTION
- FEEDBACK
- POST-IMPLEMENTATION REVIEW
- FEEDBACK
- PROJECT COMPLETION

CHANGE MANAGEMENT
Human Resources Management plays a key role in ensuring the employee involvement which is essential in the creation and maintenance of process quality goals (Gehani, 1993; Cotton, 1993).

Competitive benchmarking must be used. Success of any continuous improvement project relies on an unending search for best practices (Gehani, 1993).

Reliability of supply is an essential component of any project. The use of supplier partnerships in conjunction with the use of "Just-in-Time" (Gupta & Wilemon, 1990; Clark & Fujimoto, 1990; Imai et al., 1985) reduces waste.

Institution of ongoing organisation wide training, commencing with senior management. Training is an essential Human Resource Management tools.

Establishment of effective lines of communication (Good & Stone, 1995). Job rotation to enable multi-skilling is one of the ways of providing a more effective, efficient and satisfied workforce.

The planning process to include the setting of achievable goals, the use of a Quality manual and the establishment of service agreements.

Stakeholders, suppliers and end users continued involvement through all stages of development to enable effective feedback.
• Project team establishment and training in the development methodology to be employed.

• Thorough researching of the necessity for the change being introduced by a project. For example, automation of a process because competitors are doing so must also involve benefits to be gained.

• Developers responsibility for their own actions. (i.e. testing of components by those who are responsible for their development).

In effect the involvement of end users in usability testing enables them to share, not only in the responsibility for the quality of the application being developed but also in the intrinsic reward of a "user friendly" end product.

• Completion of a validation stage in the development cycle including feedback from end users to enable standardisation upon propagation to the network.

• Standardisation of requirements for logistical support.

• A complaint management process being put in place to immediately address issues. All contact needs to be fully documented with the time taken to resolve the problem measured to also enable continual improvement within this process.

• Completion of Post Implementation Reviews.

• Ongoing two way communication during the propagation phase to establish acceptance by the bank's clients.
• Ongoing reviews both internal and external to the bank to identify changes in service requirements necessitating changes to the customer service process.

• Recomencement of the PDCA / PDCS cycle.

**Figure 7 TOTAL QUALITY PROJECT MANAGEMENT SYSTEMS MODEL**

19.1 Quality Dimensions

A Total Quality Project Management System actually incorporates the integration of three systems, the management system, the technical system and the social system as shown in Figure 7. The extent to which quality dimensions are present in all will effect the efficiency of the model.
19.1.1.1 The Management System

The management system is concerned with the business effectiveness of the project environment.

The following quality dimensions and their attributes must be present in a quality project management system:

Adaptability The system must be able to quickly adapt to unforeseen circumstances.

Approachability Ideas must be freely given and solutions sought.

Authority Authority must be delegated. Empowerment, responsibility and accountability must be present.

Commitment Management must show TOTAL commitment to quality.

Efficiency There must be maximization of effective resource usage.

Integrity The measurement of consistency of management values must always promote the LONG term benefits to the organisation.

Leadership Management must lead by example.

Maintainability The effectiveness of the system is dependent on the ease with which existing processes can be adjusted and tuned to changing development requirements.
Manageability  Projects must be sized to be achievable with resources available.

Portability  The project management system must be able to be employed across varying project types.

Reliability  Project management must be reliable in bringing a project to a successful conclusion.

19.1.1.2 The Technical System

The technical system is concerned with the physical components of the project.

The technical system with which the management and social systems interacts should have the following quality dimensions:

Accessibility  Non-standard reporting requirements must be able to be satisfied by cross-functional communication.

Accuracy  Any given task must have exacting deliverables.

Adaptability  Is dependent upon the ease with which the existing system can satisfy unforeseen requirements (often what the user sees as flexibility).

Completeness  Specified requirements must be satisfied.
Comprehension  The efficiency of the system is dependent on the measure of the time taken to learn (or teach) how to operate the complete system effectively with the skills base required.

Consistency  Uniform design, construction and implementation criteria must be followed.

Correctness  This is a measurement of the extent to which the final system satisfies the functional requirements of the project.

Error Absence  There must be a minimization of errors found in a unit of functionality over a selected time period.

Extendibility  The ease of integration of functionality provided by a project is a measure of the effectiveness of the system.

Fault Avoidance  The "smarts" built into a system must allow for its use by inexperienced operators.

Integratability  Depends upon the ease with which the system can be interfaced with other systems.

Limitations  The system design must involve boundaries within which changes can occur without forcing a modification to other systems.
Modifiability  The quality of the system is dependent upon the ease with which the impact of a change to an existing function can be assessed and the change implemented.

Operability  There must be a measure of operator time wasted by error, unnecessary work, related illness, etc. while the system is in normal usage.

Simplicity  The degree of complexity present in components to the system, the degree to which testing of the system is necessary and the degree of integration necessary are all quality dimensions of the system.

19.1.1.3 The Social System

The social system concerns the Human Resources functions of the project.

The social system with which the management and technical systems interacts requires the following quality dimensions.

Adaptability  The social system of the organisation requires it to be willing to adapts to change.

Acceptability  The extent to which change is accepted.

Culture  The extent to which a quality culture is already present within the organisation will impact on this quality dimension.
Health & Safety  The extent to which human health and
    safety is dependent on successful
    operation.

The Individual  The extent to which the individual's
    needs are met by the project and
    organisation.

The Team  The extent to which the group needs are
    met.

Usability  The degree to which the system, when
    interacting with people, is understood,
    matches expectations and is integrated
    into the normal work patterns.

19.2 Leadership and Commitment

One of the major components of Total Quality Management
and the most important component of an effective project
environment is LEADERSHIP. Without it implementation of
quality practices will fail. Leadership is concerned
with creating the environment in which individual
attitudes and behaviors, and the research and development
department's culture, can be changed to enable the
adoption of TQM principles.

Leadership, however, starts with senior management who
must be committed to developing leadership qualities in
both themselves and their employees. To this end it is
important that they understand what it means and how to
provide it.
19.2.1.1 Senior Management

While some authors (e.g. Cooper & Klienschmidt, 1987; Gupta & Wilemon, 1990; Zirger & Maidique, 1990) suggest a supportive role others (such as Imai & colleagues, 1985) note that senior management should engage in “subtle control”.

The idea behind subtle control is that members of successful teams maintain a balance between allowing ambiguity such that creative problem solving flourishes, and inward support control to ensure the project fits the overall corporate strategy.

Brown & Eisenhardt (1995) found that a balance between the two produces the best performance.

To enable the effective implementation of Total Quality Project Management throughout the organisation senior management needs to do the following:

- Include implementation goals in the organisations business strategy.

- Become involved in, as well as committed to, the implementation of Total Quality Management by the allocation of necessary resources.

- Establish and communicate cross-functional deployment goals.

- Employ policy deployment and Audits to attain these goals.
• Show a personal involvement in the building of the system, and establishment of procedures conducive to TQM.

• Support middle management in their efforts to establish and maintain a creative climate within their particular area.

Training in quality disciplines for senior management needs to be in place. This training must focus on the application of quality techniques so that fact rather than opinion drives quality improvements.

In passing enthusiasm to others management must be "seen" to be committed to quality rather than simply paying lip service.

To this end top management should set the standard by:

• Develop a vision of the future and communicate it throughout the organisation.

• Set specific quality objectives.

• Lead by example.

Studies of successful companies by various authors show that their senior management all follow these three rules.

What management "does", not what they "say" is important.
19.2.1.2 Project Management

The quality of leadership present in a Project Manager is important to the success of the project. Desirable attributes suggested in a project manager are:

- **A leader** - must lead and command respect.
- **A planner** - able to develop control systems and estimating, scheduling, and tracking mechanisms
- **A motivator** - able to create and retain a creative climate within the team.
- **A financier** - with the need to understand accounting principles and have a broad strategy of profit enhancement through the TQM concept.
- **A juggler** - not being one eyed about quality. Must be enthusiastic about the virtues and values of TQM, but not to the extent of distorting commitment to the strategies of the organisation.
- **An innovator** - must be able to envisage new ways of doing things.
- **A defender** - in regards to principles by which he/she operates. Must be able to make tough decisions important to creating a quality culture and act as a conscience in this respect.
- **A coordinator** - needs to possess interpersonal skills necessary for a cross-functional communication role.
• An achiever - needs to be committed to achieving set goals and targets.

19.3 Strategic Planning

The constantly changing face of today’s business environment is forcing organisations to adopt a leaner, less resource hungry approach to survive (Russell-Hodge, 1995; Dean & Kennedy, 1982). The ability to cope with increasingly technically sophisticated customers demanding even higher levels of service is drawing heavily on an organisation’s ability to manage the process of change.

Structured solutions are applied to structured problems by traditional product based organisations. Service organisations, on the other hand, attempt to offer structured solutions to unstructured problems (Russell-Hodge, 1995).

In the banking industry the conduct of the business is far more complex than thirty years ago when retail banking only offered its customers the choice of a handful of simple products.

The speed at which change is occurring requires management to recognise that the strategic direction of the organisation of the future involves adopting a project oriented approach to change.
It is therefore imperative that, in order to satisfy a more discerning customer, a process of continual improvement must be employed not only in the undertaking of projects, but in the development of more effective strategic project planning (Russell-Hodge, 1995).

Strategic objectives are increasingly being aligned with a customer oriented focus to ensure the future success of the organisation (Russell-Hodge, 1995). Failure of senior management to take a pro-active stance in this direction will result the failure in the long term to meet the goals of the bank.

Change through projects is an integral part of attaining set goals.

Strategies for implementation of change through projects must be pro-active not re-active and need to include the following considerations:

• By addressing long term objectives, management is able to ensure that quality in the design and implementation of new systems, or changes to existing systems, is maintained. This often entails a change in management philosophy.

• Any proposed new system or change to the existing one must be examined to ensure that it is consistent with and contributes to the long range (strategic) objectives of the organisation.
• Old fashioned ideas that managers are the experts in identifying and fixing problems must be disposed of and subordinates given a participatory role in developing methods to meet strategic objectives.

• A project implementation strategy must encompass support and involvement from all levels of the organisation, particularly senior management, who must ensure that the main focus of the strategy employed for introduction of quality systems is by attention to the process rather than to the results.

• Quality planning and control must ensure that a structured development process for change is put in place. The responsibility for system design and implementation should be clearly defined and those resources controlling the design and development processes empowered with appropriate authority to implement required change.

The following issues should be taken into account when developing project strategies in today's fast changing banking environment:

• The longer the time taken to deliver a project the higher the risk that advances in technology will reduce the business benefits.
• Prioritization of small projects and limitation of the number running concurrently to ensure resource limits are not over stretched thus, rather than delivering more, delivering less.

• Conduct of impact assessments, including value analysis, of projects delivering new technology. Examination of available options should include internal development, purchase of externally developed systems and software, and the "do nothing" choice.

• High level business system requirements must be dynamic. It is much easier to deliver specific requirements with small projects than larger ones. Freezing requirements, particularly for larger projects only postpones the change and delays delivery of what is needed further.

• The scope of the Project Manager's role must be broadened to give as much attention to the "external" factors as they give to the "internal" ones. Project Managers need to be on top of what is happening to the business and its customers, and be aware of the goals and targets of the business. They need to be aware of other projects and coordinate regularly with those that interface with their own. They must communicate effectively with their peers, senior management and customers while controlling project planning, task assignment, monitoring, and team motivation.
Beckhard & Pritchard (1992) suggest that there is a high correlation between the failure to implement (effective) change and the lack of conscious management of the transitional change.

As a method of controlling and directing these complex projects to successful conclusions, it is strategically important that the following activities be included in any project:

- There being clear definition of the tasks to be undertaken.
- Creation of a management structure dedicated to accomplishing the tasks associated with projects.
- Development of sound strategies for obtaining commitment necessary from all key players.
- Design of a strategy, and deployment of the mechanisms necessary, for establishing clear cross-functional and inter-departmental communication channels.
- The assigning of dedicated resources to assist in the managing of the project.
19.4 Concept Development

In the finance industry there is little difference in the products offered by different banks. Though the enticement for new clients to establish a connection with a bank is dependent on the marketing strategy employed, the retention of business is reliant upon the quality of service provided. Service is, in effect, the prime product of any bank.

Well conceived and designed technology driven business systems provide a delivery system for enhancing this service.

Thus the delivery vehicle and the method in which it is used can have a large impact on the business benefits to be gained. Ensuring that the concept is sound sets the standards of quality for the project.

19.5 Project Identification

The following strategic priorities must be established in identification and undertaking of projects:

- The purpose of the project.

- Definable quantitative AND qualitative benefits to be derived from the project, both in the long and short term.

- The deliverables of the project and the method proposed to produce them.
A customer focus must be implemented in identifying which business systems will enable a bank to retain and improve its competitive advantage.

Projects undertaken by banks vary in size and complexity and it is therefore difficult to define a set formula which will work in all cases. However, prioritizing projects based on their strategic importance allows a bank to examine development options which will produce the most beneficial results.

19.6 Project Strategy

Quality project planning is fundamental to the success of all projects. In formulating a good planning strategy the following requirements should be noted:

- Costs and benefits of the project must include measures of qualitative as well as quantitative factors.
- **Deliverables** must be clearly defined.
- Once the delivery vehicle is decided upon and its limitations established, **documentation** of initial specifications must be completed to enable workload estimates to be included in the development project plans.
- **Lead times** need to be built into plans to ensure a process of evaluating the system during the course of its development is included.
Sufficient resources must be allocated to complete tasks within the estimated workload timetable. Overlap of resource allocation should be avoided, particularly for critical tasks which should be identified and allotted sufficient resources for completion within allocated time frames.

- Having obtained workload estimates, attainable targets need to be set to ensure Quality of design of the system is maintained.

- Effective communication channels need to be established to ensure that the communication gap is bridged both sideways and top to bottom and bottom to top.

- Continuous revision of the plan as a controlling function must be undertaken to ensure objectives of the project are met.

- In the undertaking of a Quality project, just as in the production of a Quality product, there is a need for PDCA/ PDCS cycles to be in place in the short term for developing a business system and in the long term for continual improvement to the system.
In the words of Deming (1982) "There are two types of Quality in any system....the first is Quality of design...the second...is Quality of production". Planning therefore needs to include the provision for completion of a PDCA/PDCS process in the development cycle.

19.7 Development Criteria

"Statistical thinking is critical to improvement of a system"(Walton, 1989, P65).

A quality system should be "user friendly". There is therefore a need for the following factors to be included in the development methodology to be employed in designing a quality business system:

• Thorough analysis of system requirements, constraints and limitations.

• Use should be made of both the seven basic and the seven new tools of Quality in analysing requirements of the system, planning of development and implementation.

• The simulation, during the development phase, of the environment in which the system will operate enables identification of user issues with the system at an early stage while encouraging feedback during the development process.
• Development of expertise in system design among research and development resources encourages creativeness and enables innovative ideas to be tested within the development environment.

• The development of technological know-how and support to ensure that on-going changes will continue to be developed in a Quality environment.

• Development of required training in the use of the system must be included as part of the development process rather than as a "tack on".

A well-defined, disciplined and innovative development process in which all resources are involved in simultaneous problem solving will ensure the end result as being delivery of a Quality system.

19.8 Management Planning

The successful integration of Quality Management Planning (QMP) with the introduction of change through development of any new system or change to the existing system is seen as an being of paramount importance.

It requires communication, leadership and an understanding of the organisation's culture. The viability of any proposed change should be carefully examined before any decision is made.
19.8.1 Change Management

Fear of the unknown is a major reason why we resist change. Studies by Brown & Eisenhardt (1995) among others have highlighted that communication of change, to not only the project environment but the whole organisation, is one of the most important issues in the establishment of a successful and productive environment. Katz & Tushman (1981) found that change managers not only gather and translate external information but also facilitate the external communication of their fellow team members.

By communicating clearly at an early stage the changes to be brought on by a project we take away, or at least minimize, resistance due to the unknown.

Deming (1982) states that effective communication of the reasons why change is required together with a thorough understanding of the selected management approach should ensure sustainable improvement and acceptance is achieved therefore negating any "fear of the unknown".

For major projects a steering committee should be set up to guide the direction of the change. A high-level committee is more able to link changes to the wider organisations goals while assisting in the breakdown of barriers of resistance to change (Cohen, et al, 1988).
Other reasons for resistance to change in a customer-service organisation, such as a bank (Grimaud, 1994) include:

- a perceived threat (real or imaginary) to job security,
- no perceived need for change,
- a threat to vested interests and current positions of influence,
- poor timing,
- a lack of resources,
- no perceived personal gain,
- threat to established social relationships, and
- fear of incompetence.

Resistance to change, however misguided and particularly when stemming from middle management, can stifle creativity, often resulting in failure of the project. This negative impact of change can be controlled by a combination of:

- ensuring the fears of the individual are allayed by clear communication of both the reasoning behind the decision to undertake a project and the vision of the future state.
- ensuring that sufficient resources are allotted both to training and ensuring effective implementation of the project.
The bridging of the communication gap by involvement of senior management, middle management, suppliers, product owners and the end users of a new system in its design enables the negative effect of any change to be minimized by identifying and solving, prior to the implementation stage, any potential problems.

Effective lines of communication need to be in place to enable productivity of the development process to be maintained.

The more open that channels of communication can be kept, with the free flow of meaningful information in all directions, upwards and downwards and sideways, the less stress is generated, and the more likelihood of a rapport being established both within the team and between staff and management.

The variation in the terminology used by people of varying technical backgrounds presents a complex "language" problem.

Specifications written by business analysts, for instance, are often open to misinterpretation by technical analysts, and visa versa.

For example, a non-technical analyst may specify that, given a certain set of conditions, an error message should display.
The interpretation placed by the technical programmer on this request may result in his programming the display of a message showing only an error code.

This code, while perfectly understandable to the programmer, would only be a source of confusion to the end user. If, however, the non-technical analyst specified the wording of the message box this problem would not arise.

Clear communication of requirements, whether interpersonal or documented is essential to quality project management.

The role the project manager must play in ensuring misinterpretation and misunderstanding are kept to a minimum is therefore critical to the development process.

19.9 Human Resource Management

Allocation of sufficient resources as well as Education and Training is the responsibility of management.

Innovation in the allocation of resources for long term planning shows support of a commitment to Quality.

To enable the optimum standard of productivity to be obtained and maintained from available human resources a creative climate needs to be established within the project team.
19.9.1.1 The Creative Climate

The first major element required is that of challenging work, a determining intrinsic factor in retaining the commitment necessary for effective performance.

The use of multi-skilling and job enlargement to enable individuals to follow a project from conception to implementation to the marketplace should be used to enhance productivity (Dougherty (1990). Improvement of the skills and knowledge of the development team improves not only their problem solving abilities but their morale and therefore ensures efficiency of output.

Secondly, the setting by management of realistic goals is required so that that project team members can work towards an objective rather than remain in an uncertain state of achievement. "Failure of management to provide employees with information they need to carry out a task creates a gap of uncertainty, which inevitably produces stress" (Cohen, et al., 1988, p.238). Lack of certainty tends to stifle the creativity of the group.

The third component of a creative climate needs to be feedback. The provision of immediate feedback is necessary in a successful project environment.

It forms part of the learning process which assists in personal development.
Continually searching for new ways to improve the development process, those involved in a TQM project need to be supplied with knowledge of results of their work as part of the learning process assisting in their personal development.

Fourthly, a reward structure and recognition system capable of rewarding creativity needs to be in place. Such extrinsic rewards may include financial support in undertaking external studies, seminars and conferences to assist in further personal development.

Experience gained from each development cycle must be reviewed to enable constant refinements to the development process to be made.

19.9.1.2 The High Performance Culture

Following are five characteristics of a High Performance culture which need to be established in employing an ethic of Total Quality Project Management:

- **Delegation** - giving the responsibility for decisions and actions to those who undertake the tasks and have the appropriate level of skills.

- **Cross Functional Teamwork** - involving the right people at the right time across functional boundaries working for the good of the organisation. Ancona & Caldwell (1990) found that when there were more functions represented on the team there was more external communication and better management rated performance.
• **Empowering people** - giving people the right to make decisions and be responsible for their own actions.

• **Integrate people with Technology** - they must be enabled to exercise initiative and creativity.

• **A shared sense of purpose** - sharing the vision, based on a clearly defined set of values of the organisation's purpose for existing and the methods for realizing it.

There is need to recognise achievements of the individual as well as the team to ensure productivity is retained.

If recognition is based upon results obtained rather than effort input the morale of both the individual and the group will be adversely effected. Recognition can take the form of both extrinsic and intrinsic rewards.

Remuneration based on productivity is an extrinsic method of ensuring optimum productivity. A creative climate is, in itself, an intrinsic method of increasing output.

### 19.10 Employee Involvement

The involvement of all parties effected by the implementation of a project from the formulation stages through to implementation and beyond is essential in establishing a Total Quality Project Management environment. This involvement applies to internal customers along with management, development teams, suppliers and Quality Assurance and other stake holders.
This follows the view of Cohen et al. (1988, p. 417 that "the most effective way to ensure that change is implemented with minimal resistance is to involve those affected by it in determining what it should be".

19.10.1 End User Involvement

Ongoing user involvement during the project helps in its completeness by:

- Assisting the user to understand what is being built, thereby ensuring that there is in fact a demand for the system.

- Involving the internal end user in quality inspections, thereby undertaking two functions.
  The first involves the verification that the system meets the user's quality requirements. The second helps validate the quality of design.

- Giving the user final say in design decisions. User satisfaction with the final product is more likely if he has agreed to the design.

- Allowing the user to set priorities (especially with change control). The person closest to the process best understands the process.

- Making the user accountable for the achievement of business benefits. By assuming, in part, responsibility for the design the user also assumes responsibility for achieving the desired business benefits of the system.
By allowing the user, during the development process, a "look and feel" of how the system will work feedback is obtained that results in the ability, at an earlier stage of development, to refine the system prior to installation, thereby minimizing rework costs. One of the most effective ways of involving users in the development process is through the utilization of a Usability Laboratory (See 19.22.12).

19.11 Project Management Roles

For effectiveness in the adoption of a philosophy towards the implementation of a TQM culture the Project Manager's roles include:

- Responsibility for actual deployment and cross functional management of change directed by senior management. To this end the model calls for delegation of both responsibility and authority to those charged with delivery of the project.

- Establishment, maintenance and upgrading of project guideline standards constantly.

- Within the framework of a TQM Project environment the leadership role of the Project Manager must focus upon the creation and maintenance of a creative climate.

- Instituting of required training of project personnel.
• The maintenance of a climate conducive to problem solving and by encouraging the use of the 7 basic statistical tools as well as the 7 new tools of TQM (Imai, 1986).

19.12 Project Team Characteristics.

Experts vary on the optimal team size with between three and six preferred.

The ideal team should be comprised of employees with the following characteristics and skills:

• Team composition should be based on selection of the best, most appropriate person for the job and not the most (in a functional or political sense) expendable.
• Their availability when required is necessary.
• They must be team players.
• They must act in the interest of the whole organisation rather than the functional group to which they usually belongs.
• They should possess knowledge of the process being dealt with by the project.
• They must be experienced and trained in the appropriate skills required.
• They must be able to "think outside the square" in addressing problems.
• They must be committed to achieving results within the time frame allowed.
• They must be trained in the use of TQM tools, and
• They must be committed to Quality.

• Ideally, as constant change within the banking industry requires a continuous stream of projects, the author suggests a core of “in-house” project team “professionals” should be established. The cross functional skills developed by such a team helps to improve internal and external communication (Brown & Eisenhardt, 1995).

No matter if the project time frame is a week or 5 years the initial step should be to create a vision statement of the ideal team at some time in the future.

19.12.1 Team Development

The developing of a strong group spirit among the development team is necessary to make mutual cooperation the "norm" and adds to the productivity of the group (Ancona & Caldwell, 1990).

A relative "equalness" of status among analysts, both business and technical should be established thus leading to a more productive and creative climate being attained. Communication also plays a major role in establishing team cohesiveness, thus enabling retention and improvement of productivity. (Imai et. al., 1985; Katz & Tushman, 1981; Zirger & Hartley, 1996)
Some of the methods of improving cooperation and communication are:

- Involvement of team members in the decision making process during the long range planning stage. This involvement is important, as effective research is one of the key factors in determining the success of the method of implementing any change.

- An effective on going training and education process to assist in the personal development of all employees while ensuring the continual transfer of skills to the benefit of the organisation.

- The conceptual study of alternative approaches in a parallel mode at the ideas stage of development will enable the selection of the most appropriate one by those involved in its conception.

- The establishment of project teams that include employees from development, training and procedures, audit and logistical support.

- The establishment of regular management meetings between all project teams to ensure continual free flowing feedback is maintained.

More important factors in increased interaction are:

- The development of a strong group spirit making cooperation the "NORM".

- The development of a sense of relative equality within the teams, adding to the cohesiveness of the unit.
• The maintenance of strong top management involvement in the area of research and development.

19.12.2 Team Roles

The roles of the project team members in the development of Quality applications involves the following:

• Involvement in suggestion and implementation of new and improved methods of introducing change.

• Ensuring self-discipline is maintained in the workforce.

• Involvement in continued self-development to:
  • Become a better problem solver.
  • Enhance existing skills and develop new ones.
  • Obtain expertise in job performance.

19.13 Defining the Project

The business needs of the customer must be provided to establish the purpose of undertaking the project.

The business needs of the organisation must be identified and balanced against these needs to validate the purpose and viability of the project.

The objectives of the project must highlight the end deliverables—what is to be achieved.

The scope must clearly define the project boundaries—what is included and what is omitted.
The project *deliverables* must state what the project will deliver to the customer in terms of final output.

Guidelines must include budget, material and human resource allocation and time restrictions.

Staged projects must include a definition of how final deliverables will be implemented progressively.

19.13.1.1 Business Needs

Initial system requirements must be identified, defined, documented, reviewed, and approved as the first activity undertaken during project execution.

These requirements need to be continually monitored and reviewed during the course of the project to ensure they have not changed and are still valid.

When a project is in trouble, requirements must be revisited, restated, and re-approved.

In addition to defining the scope and objectives of the system under development, the project must be defined in detail. This definition addresses the work to be done, the resources devoted to that work, and the time that the effort will take.

19.13.1.2 Objectives

Clear objectives must be set before beginning. They must be unambiguous and quantifiable. They must be clearly documented and subject to review. A major reason for failure of projects is poor definition of objectives.
19.13.1.3 **Scope.**

The boundaries of the project need to be set and clearly documented at the outset to ensure that the focus remains on the reason why the project is being undertaken and is not lost.

19.13.1.4 **Deliverables**

The deliverables of the project must be definitive in terms of what will be delivered to the customer and when it will be delivered.

19.14 **Requirements Gathering**

Clear definition of requirements for any project is crucial to its success. These requirements are defined by the customer.

19.14.1.1 **Who is the Customer?**

The Japanese philosophy that "the next step is the customer" is highly relevant to the project environment in the implementation of Total Quality Management. In defining the requirements of a project input should therefore be sought from the following customers:

- **The External Customer** - The critical service factors involving the bank's external clients go well beyond the delivery of the service.
As well as friendly method of delivery the client's perception of service also includes the quality of financial advice, the timeliness of service provided and the accuracy of information obtained.

The exploring of these areas in depth enables the identification of which aspects of the service are of most importance to the client, rather than the bank. This enables the identification of the improvements in service that may have the greatest impact upon the client's own needs, and therefore be seen by him to be of greatest value.

- **The Internal End User** - In order to meet the needs of the external customer, to be delivered by the business system to be developed, the requirements of the main internal customer, the staff who use the system, must be met. Within the framework of the actual development and introduction of change the method of delivery to these end users is therefore a prime consideration.

  "Information must be delivered in a timely fashion and be easily accessible to users to perform appropriate analysis for quality improvements" (TQMI Conference 1991, p.142).

- **Functional Management** - In order to meet the strategic objectives of the project and the organisation the requirements of functional departments must be met in any system developed.
• Executive Management - Having the overall responsibility for the authorisation of strategic expenditure senior management is a customer of any project.

19.14.1.2 Other Input

Input at the information gathering stage from the following sources should also be sought:

• Hardware & Software suppliers - Identification of technology advances at this stage can result in positive reassessment of requirements.

• Technical Experts - Identification of problems associated with integrating a new system may thus be identified allowing for reassessment of requirements.

19.15 Analysis of Requirements

The initial phase in determining the design of a quality business system is to define the scope of the system, the objectives of the project, the facilities available to deliver the system and any constraints upon delivery. This analysis should encompass organisational and market requirements and limitations together with end user needs.

Analysis of existing functions and data, where applicable, should be used in specifying the system requirements.

In carrying out this analysis there is a need to obtain feedback on:
19.15.1.1 System Control

- The processes for which the system is in place. These form part of the overall requirements of the system.

- Information about the performance of the current system. To enable improvements to be made the system must be in statistical control.

- What actions can be implemented to improve the system.

- The methods used to detect faults in the system.

19.15.1.2 Human Variability

- The variability of the individual using a system is such that no two operations will be exactly alike (e.g. variation in operator computer literacy may result in increased time to perform a task, forming part of the system). It is essential therefore to distinguish between common and special causes of variation in the use of the current system.

19.15.1.3 Local Actions and System Actions

- It is necessary to identify and analyse special causes of variation and deal with them during the development cycle. "A system can be best improved when special causes have been eliminated and it has been brought into statistical control." (Walton, 1989, P113).
This feedback should be obtained from all directions (such as senior management, product owners, marketing, internal users and external customers and suppliers) and should be used in specifying initial system requirements.

In identifying components to any Quality system the following items need to be analysed:

- Inherent variability in the system itself (e.g. irregularity in demand on a computerised information system may result in variation of response times).

- Effect of failure of the system upon the productivity, morale, the process, production, etc.

- Inherent variability in the process and its effect upon the system (e.g. variability of materials used in the process).

- Inherent variability in the people using the process. (e.g. variation on ability of the worker to identify and deal with special causes occurring in the process.)

- Current market (customer) requirements. Effective market research is needed to establish the required deliverables of the system (i.e. what the customer wants).

- The ability of the proposed system to react to changes in market requirements. This is critical to the banking industry with its need to react quickly to volatile financial markets, both locally and overseas.
• Cost benefits of implementation. In examining the cost of implementing a Quality system Key Success Factors need to be identified and Key Performance Indicators used to measure system effectiveness.

The system implementation options (automated / manual / hybrid) should then be determined prior to the actual design phase.

19.16 Training Requirements

Where requirements are unclear or volatile, it is easier for non-Information Technology staff to learn to use prototyping tools than for IT staff to understand the requirements.

Firstly, project team member training requirements need to be addressed in order that development of a quality product may take place. Improvement of the skills and knowledge of the development team improves not only their problem solving abilities but their morale and therefore ensures efficiency of output.

Secondly, in ascertaining system training requirements examination of the following needs to be made:

• Type and adequacy of current training delivery vehicle (e.g. group - manual, individual- self paced computer based).

• Relevance of this method of training to the new system.

• Complexity of the system to be developed.
• Alternative training delivery methods.

Training requirements are a dynamic factor in the development of a business system and, while bare requirements are able to be specified at the commencement of the project, specific training needs evolve over the life of the project.

19.17 Project Justification

Changes should not be implemented as a "knee jerk" reaction. Projects should be subjected to feasibility-impact analysis to ensure they are within the capabilities of the organisation. A value analysis should be performed to ensure that there is benefit to both the customer and the organisation to be gained.

Value analysis should be conducted as a matter of course and not only to support a business case for undertaking a project. The value analysis must include the following:

• a clear statement of the objective to be accomplished.
• an evaluation of all viable alternatives, including the "do nothing option".
• the consequences of non implementation.
• a subjective estimate of the probability of adverse consequences if not implemented.
19.17.1 Business Case

The business case is only one element in the overall management of a project. While the project team is responsible for the development of business solutions, management is responsible for their effective definition, implementation, and ongoing benefits realization management.

Effective business case management can be impacted by a number of key factors, the most important of which are:

- **Sizing and Costing the Project.**

  To determine for a project, how long it will take and how much it will cost is of critical significance. This is a very complex area, with ingredients such as:
  - user requirements; getting them right - up front.
  - productivity; throughput and quality.
  - resource management; skill sets, availability.
  - scope (change control) management.

- **Project Management.**

  There are four major components to managing a project. These are:
  - planning the project.
  - organizing the project.
  - monitoring the project.
  - controlling the project.
These are all iterative activities which proceed over the course of a project. It is the quality of these activities which frequently determine whether a project, and its associated Business Case, succeeds or fails.

19.17.2 Cost Components

The following measurable cost components of the system need to be obtained to enable estimation of added value to be weighed against total implementation costs:

Value adding components include:

- Expected time saved by minimization of complexity of the system.
- Expected drop in user and system error rates.
- Expected improved productivity as a result of improvement in focus of user on the task being performed.
- Savings as a result of increased availability of the system.

Implementation costs include:

- Cost of human resources used in the development process.
- Effect of both partial and total failure / rejection of the system.
- Cost of resources required to recover from failures caused by either operator or system errors.
• Training costs, including time taken to achieve satisfactory performance.

In examining the cost of implementing a Quality system Key Success Factors need to be identified and Key Performance Indicators (KPIs) used to measure system effectiveness.

19.17.3 Value Analysis

Non Quantified Costs and Benefits are applicable to all projects, but have particular significance to the following types of projects:-

• to enhance the Bank's image.

• to improve staff morale.

• to improve staff skills or education levels.

• to improve staff or customer comfort, safety or security.

• to improve industrial relations.

• to provide systems backup security.

• to maintain integrity of information systems, customer information or confidentiality.

A team should be established to conduct of a value management analysis of the information collected.
Items which need to be addressed in conducting an analysis of the cost of and benefits to be gained from implementing the project include:

- Trends in customer satisfaction with the current set up.
- Problems associated with implementing changes to the current set up.
- Disruption to current services and productivity both during and after implementation of new or altered processes / products.
- Estimated direct development costs.
- Estimated training needs.
- Estimated cost of project failure.
- Estimated completion time. Taken into account the speed at which technology is advancing the undertaking of projects with long durations should be avoided where possible. A technology based project planning to deliver the latest functionality, when the total elapsed time to completion is more than one calendar year, can result in the delivery of an obsolete system.
- Other implementation options.
Data required for value analysis can be obtained as follows:

- **Existing Productivity Data** - such as the incidence of worker sickness & fatigue, staff morale, work force stability, skills & knowledge base etc. are all available from within an organisation.

- **Existing Workplace Environment Data** - as well as impacting upon present productivity, is highly relevant when implementation of change brought on by the project involves alterations to the current working conditions (e.g. automation of existing manual processes involving more frequent use of computers impacts on job structure and productivity). Workplace Configurations including noise factors, temperature and lighting, and ventilation are all environmental considerations which must be included.

Examination of this information will enable identification of current productivity problems, thus assisting in the setting of achievable goals for the project and an initial cost analysis to be made.

- **Customer Requirements** - of both the internal and external customer must be gathered. It is imperative that management recognise and provide acknowledgment of the importance of their "front line troops".
As an initial step in ascertaining internal customer requirements, brainstorming sessions should be conducted with representative samples of the employees who will be the end users of process.

At these sessions it is important that participants be encouraged to use lateral thinking in putting forward ideas. It is of equal importance that thorough analysis of all suggestions be undertaken to ensure that the best possible solutions are obtained.

By adopting the Japanese philosophy of "going to Gemba" during the project planning phase management is able to ascertain, from those dealing with the external customer on a day to day basis, a clearer picture of the customer requirements.

Data on customer satisfaction levels from both these sources and market research can assist in evaluating the worth of a project before commitment of capital and resources.

19.17.4 Project Costing

Points to consider when conducting costing of a project:

- Direct measurable costs include project staffing costs, material costs, cost of provision of office space, training costs, etc.

- Indirect, but measurable, costs include those such as staffing costs to other departments to provide cross functional support to the project.
19.18 Approval Phase

High level planning of a proposed project should include

- appraisal of the current system,
- identification of the capabilities of both the developing system and the users of that system,
- input of feedback from current users as well as existing and potential suppliers of components to the system, and
- the employment of technical design know how and establishment of the technical limitations of the proposed system and delivery vehicle.

Upon examination of the value analysis of the available options senior management should consider the short range costs with long term benefits in setting the goals of the project.

Approval for the planning phase of the project to continue must be communicated to the project planning team.

The lines of responsibility for design and maintenance of the system need to be established to ensure quality standards are maintained. Decision making authority should accompany this responsibility.
19.19 Pre-Design Phase

Further brainstorming at the pre-design phase by those involved in the undertaking of the project should be conducted to help identify further requirements as well as problems associated with implementing the project.

Use of a critical examination sheet such as that used for the design, manufacture and installation of a seated telling work station, and shown in Figure 8, should be undertaken at this point with the aim of eliminating unnecessary work.

For the effective design and implementation of any Quality system efficient communication links between senior management, middle management, research and development, production and marketing, are imperative.

A lack of feedback is a recipe for disaster when undertaking any project.

The implementation of Murphy's Law to the development process can be considered beneficial if management listens to the "Noise". Constructive criticism is the backbone of a successful development process.
## CRITICAL EXAMINATION SHEET - INSTALLATION OF SEATED TELLING WORK STATION

<table>
<thead>
<tr>
<th>PRIMARY QUESTIONS</th>
<th>SECONDARY QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td></td>
</tr>
<tr>
<td><strong>What is achieved?</strong></td>
<td><strong>Is it necessary -why?</strong></td>
</tr>
<tr>
<td>Improved productivity</td>
<td>Less worker fatigue.</td>
</tr>
<tr>
<td>Less litigation.</td>
<td>Cost to bank</td>
</tr>
<tr>
<td>Standard environments</td>
<td>Savings in renovation costs</td>
</tr>
<tr>
<td></td>
<td>Changing teller profiles</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Place</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Where is it to be done?</strong></td>
<td><strong>Why There?</strong></td>
</tr>
<tr>
<td>Network wide.</td>
<td>Standardize</td>
</tr>
<tr>
<td>At all retail banking sites.</td>
<td>Standard customer interface.</td>
</tr>
<tr>
<td>At all telling points.</td>
<td>Tellers work continually in that area.</td>
</tr>
<tr>
<td><strong>Sequence</strong></td>
<td></td>
</tr>
<tr>
<td><strong>When is it to be installed?</strong></td>
<td><strong>Why then?</strong></td>
</tr>
<tr>
<td>Outside of business hours.</td>
<td>Causes minimal disruption to business.</td>
</tr>
<tr>
<td>On a region by region basis</td>
<td>Less costly.</td>
</tr>
<tr>
<td><strong>Person</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Who does it?</strong></td>
<td><strong>Why that person?</strong></td>
</tr>
<tr>
<td>Installation of modules sub-contracted</td>
<td>Most cost efficient</td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td></td>
</tr>
<tr>
<td><strong>How is it done?</strong></td>
<td><strong>Why that way?</strong></td>
</tr>
<tr>
<td>Modules manufactured at a central point.</td>
<td>Standardisation of alterations</td>
</tr>
<tr>
<td>Installed by sub-contractors.</td>
<td>Cost efficiency &amp; geographic necessity</td>
</tr>
</tbody>
</table>
19.20 Design Criteria

The establishment of the design criteria for a project is perhaps the most critical phase in ensuring its success. Attention to the design requirements of a system is the foundation of any successful project. The greater the number of quality attributes engineered into the system during development, the greater the degree of confidence in its acceptance and maintainability. It is also likely that as the maintainability of a system is improved, the capacity to handle additional changes will increase.

The technical and economic verification of the available options must be undertaken at this stage of development when quality options must be examined to ensure the "best fit".

Validation of the "best fit" should be undertaken by the staff who will use the end product / process.

Ease of maintenance, a feature of a quality system, cannot be ensured by the functional specifications. New systems should therefore be designed and developed with maintenance in mind.

This should be done in three ways:

- Involving staff who have already worked on system maintenance, and who are therefore able to add the benefit of their experience.

- Enforcing development standards: and

- Using modern development methods.
Enforcing design standards encourages the development of high-quality systems. Design of any system involves varying component parts. Computerised Systems, for example, include two major components: hardware and software.

Comprehensive documentation of requirements for all components to the system form an important part of its development.

In formulating the documentation of these requirements the following desirable qualities of a business system should be included:

- A quality business system needs to be adaptive to the physical, emotional, intellectual and knowledge traits of the people who use it.

- A quality business system must permit the user's attention to be focused on the task at hand, namely the process for which the system is designed. Ensuring the complexity of a system is minimized enables the user to concentrate on the task at hand leading to increased efficiency, productivity and user satisfaction by enabling the available actual work time to be increased.

- The quality business system should be self explanatory with steps needed to complete the process being obvious and supported by the system itself.
• A quality business system should be intuitive requiring actions which come naturally to the operator. (i.e. it must be "user friendly").

• The expected actions of the system should be predictable.

• Flexibility within boundaries in a system allows people using the system to make mistakes, while still retaining integrity. Retention of the integrity of the system is a key issue in customer satisfaction and is still possible by the laying down of these boundaries.

• To be effective a system needs to be available. System unreliability creates dissatisfaction with both the internal user and the external customer. Customer satisfaction is judged not only on the quality of the manufactured or service product but on the system used to deliver that service or product.

"Ease of use" is an ultimate design criterion for any system. However the implications of this expression are complex. Just some of the methods which can measure system ease of use are as follows:

• Training time required to achieve satisfactory performance.

• The rate at which use of the system becomes habit.

• The number of errors constituting a reasonable error rate applicable to a competent person.
• Responses attributed to user frustration which may indicate rejection of new procedures.

• Limitations on the number of people able to use a system at the same time (highly relevant to automated business information systems).

• Irrelevant actions required for, but not directly related to, the tasks being performed (e.g. when a bank clerk is required to have the customer sign a manual form during the completion of an automated transaction.

• Display of irrelevant information which impacts upon the time taken to complete the task.

• Start up time and the necessity to re-learn required skills in using an infrequently used tool or process. This can also relate for instance to warm up time needed for a frequently used automated information delivery system before satisfactory speed and accuracy is attained.

• Time taken to identify a problem, analyse relevant information and select a suitable action.

• The length of time a person can work before fatigue sets in.

• Failure recovery time which includes the amount and cost of resources required to recover from failures caused by either operator or system errors.
• Where a combination of manual and automated systems are in use the time taken to achieve a satisfactory level of skill upon shifting from using one system to another.

19.21 Design Phase

This phase involves the detailed design of the structure of the system together with the procedures and processes to be used. The employment of Quality standards in designing a system is imperative.

19.22 Prototyping

Change can be addressed in three main ways - evolutionary, revolutionary or incremental, and the use of prototyping is applicable to all.

In the evolutionary approach the use of prototyping allows for implementation using "building blocks". Where dealing with leading edge technology, for example, this approach allows for easier integration of components required to deliver the goals of the project.

The incremental approach allows for earlier delivery of partial functionality but involves greater risk of problems associated with integration.

The revolutionary approach involves the re-engineering of processes by a re-assessment of the business requirements and focuses on dramatic changes to provide a quantum leap.
Regardless of whether an incremental, evolutionary or revolutionary approach to development is undertaken the use of prototyping ensures a higher level of quality of design. The larger the project the more cost effective is the use of prototyping.

Any new or enhanced technology based business system developed for use today’s banking environment will normally involve such a system interacting with existing systems. The use of a prototyping approach enables the validation of both the usability of the system and its functional compatibility with existing systems.

Particularly when assessing large scale applications, a prototyping approach provides valuable feedback from users, whose observations highlight fundamental flaws in the system's scope. Specification changes, or even complete rejection of the system, at an early stage saves valuable time and money.

The implementation of new technology often involves areas of the business which are less well defined than those where a precedent has been set or may be inappropriate. Some projects have goals, procedures and requirements which are unclear due to the rate of change exceeding the time given to deliver a solution.
In these cases the use of a prototyping approach allows for:

- the use of business goals rather than business processes as a focus for prototyping to identify both what features are required and what are not required.
- senior management leadership and support for the prototype process to ensure that, where incompatible requirements are identified, they are resolved from an organisational viewpoint rather than incorporated by unnecessarily duplicating systems.
- clear communication of reasons behind decisions by project team members (such as technical constraints, business priorities, consistent requirements, etc.) so that, by clear understanding of why decisions are made, the goals of the project can be kept in focus.

For effective use of prototyping, however, the following controls need to be in place:

- **Owner** - Sets business priorities.
- **Focus** - Consists of a business objective or starting point for development.
- **Scope** - Controls boundaries of prototype's functions. In practice the precise scope is unknown at the outset.
- **Standards** - Standards of prototyping are dynamic and must be under constant review. Graphic User Interface (GUI) standards, widely used in industry, are constantly changing and being reviewed.

Prototyping of the system should include suppliers, end users, marketing department, development analysts/engineers, and management in an on-going process to provide constructive feedback and support.

The involvement of suppliers in the development process is necessary to ensure that the quality of components used in the delivery vehicle remains high. Meeting high standards of Quality in developing a new system will not be possible without the same level of commitment being obtained from this source.

The involvement of the end user of the system is necessary to ensure that the processes involved meet the requirements of the internal customer.

A poorly designed and delivered system which fails to recognise the needs of the user will fail to effectively meet the requirements of its implementation.

In the development of a quality business system special causes of variability need to be identified and eliminated at the design stage.
System delivery times need to be examined. When designing information systems it should be recognised that a crucial user requirement is that information be delivered in a timely manner.

A quality business system needs to allow for the variability of the user. "Differences between people...must be attributed to actions of the system, not the people.

Outstanding performance may be attributed to someone that... falls beyond the limits of the variation of the system, or creates a pattern." (Deming, 1982, p110).

Once a prototype of a new system is built it should be "road tested" by end users for its effectiveness and any necessary amendments made and re-tested prior to implementation. One of the most effective methods of ensuring quality deliverables in a business system is by conducting user testing in a Usability Laboratory to validate both the design and "usability" of the system.

**19.22.1.1 What is a Usability Laboratory?**

A Usability Laboratory is a facility used to capture user responses, via audio-visual equipment, to the use of the business system prior to its general release.
At various stages during the development cycle each application is evaluated by the end users to obtain feedback on the user acceptance (usability) of the process. Reviewing of the tapes of these sessions assists in the objective analysis of problems encountered.

19.22.1.2 Use of a Usability Laboratory in Project Development.

Using such a facility, problems can be identified and solutions provided at an early stage of development by obtaining first hand input from the following key players:

- **Project Management** - Project managers responsible for the various development teams implementing specific changes being developed.

  As their roles include responsibility for creation and retention of creative skills within their respective teams, this Action Learning environment provides an excellent opportunity to hone the skills of their team members.

- **Non-technical Development Personnel** - those project team members who are responsible for specifying the business requirements of the system, including training requirements.

  Non-technical concepts of how to implement the desired change differ from those held by technical experts.
• **Technical Development Personnel** - the design engineers and other technical resources responsible for interpreting specifications, designing prototypes, integrating new applications with the current platform and delivering the specified system, including automated training.

Although the design engineer in the traditional project (unfortunately) is not normally expected to concern himself with employee behavior patterns or with market characteristics (Warmington, 1980), in the environment of a Usability Laboratory the issue of employee behavior is one of the parameters on which the evaluation is based. By observing evaluation sessions in progress the designer is better able to understand and address behavioral issues relating to the technological literacy of the user effecting the "usability" of his/her design.

• **Product Owner** - the owner of the products to be delivered by the new business system. Being the one who is paying for the project this stake holder’s involvement in this part of the process is advisable.

• **The Internal Customer** - the staff who will be the ultimate users of the system and who evaluate the developing product or process while supplying feedback on its "fitness for use".
• **External Software and Hardware Suppliers** - in being able to observe, first hand, the reactions of the end user while discussing problems with the development team, suppliers are able to identify more clearly misinterpretations in meeting specification requirements.

• **Planning Management** - the ability of planning management to observe the capabilities of both the developing system and the users of that system enables more accurate logistical considerations to be included in future projects.

19.22.1.3 Strategic use as an Action Learning Tool

Successful strategies for the integration of Quality management planning can be established by a bank in its use of a Usability Laboratory by:

- Providing direction to marketing.
- Improving product design.
- Improved delivery time.
- Improved staff morale.
- Increased efficiency of development team.
- Decreased quality costs.
By being able to observe, first hand during the development cycle, the problems associated with implementing the change, both technical and non-technical key players in the process are able to engage in a dialogue whereby problems are addressed at the source enabling fixes to be made prior to general release.

The individual skills, experience and competencies of these people can be combined to achieve enhanced problem solving and the expansion of knowledge and learning (i.e. they undertake a process of Action Research and Action Learning).

In involving themselves in the evaluation process management is able to ensure that effective and efficient top to bottom / bottom to top communication is present.

In being able to bring together representatives of all parties in an interactive situation this facility can be better employed for a three-fold purpose:

- creation of a hands on approach to problem handling and solving.
- creation an atmosphere of conciliation between the business and development team in changing specification of functionality requirements.
- the coordination of the introduction of an Action Learning culture into the bank, a prerequisite of a true TQM organisation.
The lateral thinking which can result from the interaction of players during these sessions can enable retention of the critical mass necessary to attain the project goals.

Further non-tangible benefits ensuing include:

- Increase in capabilities of the project team.

- A pro-active part taken by senior management will ensure that the learning process is an organisation wide one.

- Decrease in development costs and time with less rework benefiting the bank, its employees and its clients.

- Less resistance to change created by staff involvement in the development process. Being included as a stake holder in the development process gives the end users, through their representatives actually conducting the evaluations, a share in the ownership of the project. The potential benefits from both a staff morale and a productivity standpoint are considerable.

- The observations by senior management, middle management, development team members and other key players together of the progress of the project enables a dialogue to take place ensuring that clear communications are maintained.
This presents an opportunity for improvement of not only analytical problem solving skills but also interpersonal skills of all involved.

In bringing together technical and non-technical members of the development team, management and the end users of the process (customers) behavioral and attitudinal data can be obtained and examined to ensure the end design of the product/procedure includes solutions to "usability" issues.

19.23 Project Tracking

In the use of project management tools for scheduling and tracking it is essential that the tool does not drive the process.

In extracting information for project management the key questions are:

- What is expected?
- What are the management reporting requirements?
- What questions need to be answered?
- What information is needed to manage the project?
- Is progress to be measured by phase or by deliverables?
- Are resources to be measured by hours worked on specific deliverables?
- Will resources even be measured?
19.24 Time Management

Minimization of the project time frame can be undertaken at intervals during the project as follows:

- By effective communication in narrowing the scope and gaining agreement through an early understanding of the risks / opportunities created by the project. The use of brainstorming should be both encouraged and employed in this early stage.

- Improved definition of the project by the use of analytical tools such as fishbone diagrams, tree diagrams and affinity diagrams.

- At the design phase the division of the project into components using Computer Aided Design (CAD) software may shorten the design period.

- During the construction phase the use of quality inspection methods such as the B7 tools will reduce variability and improve quality of output.

19.25 Quality Assurance

The roles of Quality Assurance in the implementation of the project need to include the following:

- Formalized Quality Assurance checks to ensure the application developed meets defined and measurable Quality standards and identifies end user requirements.
• The development of skills including the use of the 7 basic statistical tools for measurement and analysis of developing applications.

• Establishment, maintenance and upgrading of standards constantly.

• Testing of conformance to specifications, system testing and measurement, analysis and reporting of end user evaluation of applications under development.

• Conduct of post implementation reviews and reporting of results to management and development teams.

19.26 Supplier Relationships

Reducing to a single supplier is recommended to reduce variability.

Deming's principle of ending the practice of awarding business based on price should be implemented. Use of established, reliable suppliers can allow for reduction in contingencies for material costs.

Though in the development environment differing items may necessitate a variety of suppliers a move towards a single supplier for any one item builds a long term relationship based upon loyalty and trust.

"Reduce the number of suppliers to those capable of delivering the highest quality....by having them involved throughout the development cycle to the greatest extent possible"(TQMI Conference, 1991,p,158).
From the first phase of development major hardware suppliers should be involved in the development process to ensure system compatibility and reliability.

19.27 Summary

The model stresses the following essential ingredients in the establishment of a Total Quality Project environment:

- The identification and definition of those projects which are strategically important to the organisation.
- The importance of traditional results oriented values being replaced by process oriented, customer focused ones.
- The organisation's capacity to react to the need for change, to innovate, to learn and to implement change being seen in the light of being of strategic importance.
- The recognition that learning is an essential link in the chain of improvement must be incorporated into the culture of a quality organisation. Creation of a learning culture must be defined by senior management in terms of its strategic importance to projects.
20. CASE STUDY ONE

20.1 Background

In mid 1987 a major Australian bank embarked on a corporate strategy of using the latest available technology to automate, where possible, existing customer service processes. This tactic was aimed at providing the organisation with a marketing edge on its competitors by improved access to and delivery of information and services.

The strategic plan developed involved the introduction of a PC based system, operating on a Local Area Network (LAN) and connected to the bank's mainframe computer. This system would allow client information to be accessed and updated at over 1500 of the bank’s retail branches as well as administrative departments.

It must be noted that the introduction of client server technology to a network of this size had not at that time been attempted by another financial institution anywhere in the world.

A feasibility assessment was undertaken and a business case prepared for the first stage of development, the introduction of the system and pilot application to one hundred of the bank's branches.
The business case was compiled based upon the quantifiable benefits to be gained over a five period and balanced against the perceived development and maintenance costs.

The budget was approved by the board in early 1989 and development of the system and initial application commenced. The time frame set for pilot testing of the system was October 1989.

A project management consultant was hired as director of application development projects and a development team, comprised of a mix of technical and non-technical people was selected.

Technical expertise was obtained by secondment of internal Information Systems resources complemented by, where necessary, resources hired on a contractual basis.

The non-technical project staff, who were responsible for specifying user requirements, training and Quality Assurance, were chosen on a permanent basis for their knowledge and experience of existing manual procedures. The logic used in this selection was to create a pool of development skills for use in future projects.
20.2 Development Methodology

From prior research it had been ascertained that the two main factors likely to effect the success of any technological innovations were:

- Customers demands for a wider range of products and a higher standard of service.
- Improvements in the customer servicing process have a positive impact upon productivity.

Traditionally where market research or policy changes indicated the need for the provision of a new service or amendment to an existing one, the methodology long employed had involved the specification by the product owner of perceived staff and client needs, followed by its development and delivery by technical experts.

This methodology had failed to recognise both the needs of the bank's external customers and needs and limitations of the internal end users of the customer service process (i.e. the bank's employees who, prior to automation had required only limited computer skills).

To enable identification and incorporation of these needs in any amendment to the current processes a change in the current development methodology needed to be made.
As a first step in changing this methodology a number of workshops, involving management, technical staff and end user staff who were familiar with existing manual processes were conducted. From these workshops emerged a set of basic requirements for the system.

The need for the following factors to be included in the development of a methodology to be employed by the project were identified:

- Consumer research, fully integrated into the development process to create a true Research & Development function. Strategic research creates input for development by helping define development requirements.

- The creation of a simulation environment for today and for the future. This is a Usability Laboratory, a research facility dedicated to the evaluation of the user friendliness of the developed process.

- The development of expertise in screen design among Research & Development resources.

- The development of technological know-how and support.

- A well-defined, disciplined and innovative development process in which all resources are involved in simultaneous problem solving.

- Multi-skilling of employees.
• The establishment of the framework for the implementation of all future change to commence with a draft documentation of the methodology proposed.

These factors were incorporated in a methodology document created for development of automated business systems. The document also included certain factors considered as critical to the success of the application development and delivery of Quality applications.

These included:

• Accurate project planning and quality management of available human resources.

• Accurate identification and clear specification of end user requirements.

• Involvement of end users in the development process from an early prototype stage.

• Development of "end user friendly" training and logistical support for the applications being delivered.

• Formalized Quality Assurance checks to ensure the applications developed meet defined and measurable Quality standards and identifies end user requirements.

• Adoption, communication of and commitment to a "one team" philosophy.
• Adherence to the Development Methodology allowing for scope to tailor the process to meet individual application requirements.

• Constant interactive and quality communications and support to be maintained between all parties involved in the process throughout the development cycle, including formalized, documented communication processes where required.

These communication channels include those:

• Between departments at all levels:

• Between various teams involved in the process such as business and technical analysts, Training and Procedures, Quality Assurance, Logistical Support.

• Between stakeholders, Research & Development and Information Services.

• Forming two way top to bottom communications both within individual teams and between senior and middle management.

The document further established the team structure within the bank’s Research and Development department and laid out the following phases of development:

• Defining the scope and assessing business cases.

• Specification and prototyping of customer requirements.
• Specification and design of technical requirements.
• Specification and building of Training / Help requirements.
• Building, testing, evaluation and acceptance of applications.

20.3 Project Scope

Workshops conducted during the information gathering stage identified a large number of manual processes which could be automated. In view of the mammoth undertaking involved in automating all of these processes, it was decided to address the task in a staged approach. The scope of initial project was therefore limited to the delivery of a stable platform with one initial application residing on it.

20.4 Project Delivery

Historical data combined with input from branch staff during workshops conducted in the analysis stage was used to formulate an initial specification of system and application requirements.

While technical team members identified the system requirements and commenced construction of the delivery system non-technical team members completed screen design and panel flow for the initial application.
Once a working prototype of the application was developed it was evaluated by representatives of the end user group at the bank’s new Usability Laboratory, established in line with the development methodology being adopted, and forming part of the Quality Assurance processes.

At the same time training in the use of the system was developed and evaluated as part of the development process. This evaluation enabled initial user requirements for logistical support to be determined.

As a result of this evaluation further changes to the design were made and another evaluation conducted. Following additional minor refinements and integration with the bank's mainframe systems a final evaluation and sign-off of the system from a user perspective was conducted by the user representatives.

The system was installed in five sites in November 1989. A post-implementation review was conducted at these sites to validate the "usability" of the system prior to release to the remaining ninety five sites. The results of this review indicated that users considered the system an extremely useful tool in servicing clients, while external customer satisfaction was enhanced.

Though the project was completed in close to the project deadline, being released less than one month late, the budgetary control left something to be desired, running 120% over budget.
The project was, however, considered by management a success for the following reasons:

- Acceptance by both the end users, the branch staff, and the external customers of the new system exceeded expectations.

- It was estimated that budget overrun on the project would cause retrieval of investment to only slightly exceed the originally estimated pay back period.

- It was further believed that as future applications were released this platform returns on investment would increase dramatically.

The initial automation processes led to the re-evaluation of requirements for the next stage of development, the delivery of a further application to the network, and led to a continuous improvement cycle of the system under development being established.

While the primary aim of the project was to automate existing manual processes, the adoption of this approach ushered in an era of increasing cultural change which resulted in adoption of many TQM philosophies.

**20.5 Summary**

There was clearly an effort made to follow the methodology document in delivery of this project.
At the Concept Development Phase thorough research identified the appropriate delivery vehicle while end user input to requirements definition ensured that the customer needs were met.

The adoption of a customer oriented approach to the development process was undoubtedly a critical component in the successful aspects of this project.

The case studied indicated that the possible problems associated with implementing changes to the present system were thoroughly researched during the development phase.

The user group profile of the non-technical members of the project team indicates a commitment to a customer focused approach to development and ensured effective translation of user requirements at the design stage. Further, the use of technical contractors to supplement in house resources is seen as sound in view of the entry being made into the field of Client Server technology.

Involvement of the end users in the development process indicated that a quality focus was in place to ensure customer requirements were met. Their involvement in testing the prototype gave them a stake in the project which assisted in acceptance of the change it brought, as indicated by the high level of user acceptance of the new system.
Emphasis in this project appears to have been placed on input rather than output, resulting in a committed and productive team.

Formalized communication processes have been supplemented by informal communication (e.g. usability laboratory sessions).

Budgetary control left something to be desired. The costing of the project did not allow sufficient for contingencies while the quantitative benefits were underestimated.

21. CASE STUDY TWO

21.1 Background

In recognizing that the face of banking was changing the in the early 1990’s the same bank developed a new corporate strategy to change its image and restructure its operations.

As part of this major restructure, in late 1991 the bank began evaluating options for the replacement of its aging branch telling network, which had been in service for over 15 years.

As the replacement of the existing system was considered imperative if the bank was to remain competitive the project was given a high strategic priority.
The project involved the development of a completely new platform together with a re-engineered fully automated telling system.

The existing system used input terminals connected to a modem which accessed the bank’s centralised mainframe system. Communication failures resulted in the total unavailability of the system.

It was proposed to replace the system with one utilizing a PC based application capable of storing data for transmission in the event of communication failure.

A budget was approved by the board in early 1992 and development of the system and initial application commenced. The time frame set for piloting of the system was mid 1993.

For the application development, a consultancy firm was hired to supply system development expertise to internal staff selected based on their knowledge and experience of banking procedures.

Technical project staff, responsible for the development of the platform, were seconded from the bank’s Information Services department and supplemented by system development contractors.
21.2 Development Methodology

Though the bank’s existing development methodology for automated business systems (see previous case) was used as a "template", the re-engineering nature and time constraints resulted in a slightly different approach being employed for this project.

The methodology involved, as an initial step, the gathering of requirements by the conduct of a number of workshops involving management, technical consultants, branch users, finance and accounting, information systems, hardware suppliers, personnel, marketing and property.

These workshops identified the following key issues which needed to be addressed in a framework for the re-engineering of the telling system:

- Support for the existing system was becoming less viable, with hardware replacement parts becoming increasingly difficult to obtain. Customer satisfaction with the standard of service provided was increasingly being eroded.

- The existing telling procedures of "on-line" transaction capture, "off-line" transaction balancing and overnight batch processing was recognised as not being cost efficient.
• Customer satisfaction was suffering as a result of the bank being unable to effectively provide information and service sought.

• The cost of maintaining branch cash holdings at acceptable levels was of major concern. Current branch cash management was dependent on manual estimation of cash on hand in the calculation of fund requirements.

• Double handling of transactions in the back-office balancing processes consumed excessive human resources. One time capture and balancing of transactions at point of acceptance would enable more effective use of human resources currently being employed back-office to process transactions.

• Automation, at least in part, of the current manual teller and branch balancing would be more cost effective.

The methodology to be employed involved a parallel development approach for the implementation of the delivery platform (the "support" technology) and the new telling application (the "core" technology) was adopted. The development involved not only the delivery vehicle and application but other support technology necessary to ensure that the integrity of the bank’s other systems was maintained. A new security interface between the system and the bank’s mainframe systems was a major deliverable of the project.
As the replacement of the existing telling system in the shortest possible time was considered critical the main driver in the business case compiled for the project was the delivery date.

The system as envisaged could not be introduced in a staged manner but involved withdrawing the old system and installing the new one between one business day and the next.

The reinstallation of the old system in the event of problems being encountered with the new one was not a viable option. The risk factor was therefore very high and required the system to be stable prior to release to pilot.

21.3 Project Scope

The scope of the project was restricted to processing of over-the-counter monetary transactions. Other non-monetary transactions would be handled by separate processes.

The requirement gathering workshops conducted identified the following key aspects which to be incorporated in the re-engineered application / system:

- Ease of use.
- Accuracy of the system.
- Effective Cash management ability.
- Integrity of the system.
• Availability of the system.

• Availability of a "Store and Forward" facility.

• The system needed to be cost effective.

21.4 Project Delivery

A DOS based prototyping tool was used for the development of the "telling" application, with the delivery platform being developed under IBM’s OS/2.

The application designed for this project was a much more complex one than that covered in the previous case study.

A working prototype of the application incorporating partial functionality was evaluated at the bank’s Usability Laboratory by branch staff, who were given one on one training, to validate the logic of the process flow.

As functionality was progressively added to the model further evaluations were conducted to ascertain the validity of the design and the "usability" of the application. Interactive training in the use of the application was developed and tested at the same time.

Meanwhile technical staff began to unit test this functionality and its interface with other systems on the OS/2 platform.
However, the integration of the system with current mainframe applications proved to be a stumbling block. Stabilization of the system’s secure user interface, required to maintain the integrity of information, proved to be a much more complex issue than envisaged.

Though the prototyping process was completed on time delays in resolution of issues relating to the delivery platform resulted in slippages at the integration phase of development.

As delivery deadlines passed and cost rose pressure was placed by senior management on the project team to deliver a working model.

Consequently, though considered by Quality Assurance and Project Management as still too unstable for release, the decision was made by senior management to pilot test the system in two branches in August 1993. The result was a complete breakdown of the system on the first day of release. It took more than a week to stabilize the system to the extent that the branches were able to balance their books.

As a result a further six months elapsed while further attempts to successfully integrate the system were undertaken. However, continuing system incompatibility problems resulted in further delays with, by February 1995, only 10% of the network being installed.
One of the important deliverables of the new system was the ability to receive remotely software distribution of changes to the resident applications.

While the system operated effectively in the installed sites, the limitations of the delivery system in being unable to accept these software distributions required technicians to personally visit each site to install upgrades.

Further distribution to the rest of the network was therefore suspended pending provision of a solution to the technical problems being encountered.

This facility was not made available until early 1996.

By this time however, as a result of the delay in supplying required dependability in the delivery vehicle, and following a strategic decision being made to convert the bank's OS/2 (Operating System /2) network to Microsoft Win N/T (Windows / New Technology), the project has been terminated.

21.5 Summary

The project was a tactical response to a strategic issue and as such was time driven rather than quality driven. As such delivery time was the main driver of this project. The time constraints placed on the project were unreasonable, given the complexity of the undertaking.
Conversely, the length of time taken to deliver a fully functional system resulted in changes to business requirements which negated, or at least reduced, the business benefits to be gained.

Though, following stabilization of the platform, the system was considered to provide expected functionality to those branches in which it is installed, the project could in no way be considered a success as it failed to deliver the functionality to the whole network as specified. The project has, in fact, never been completed.

As a result of the failure of this project, the bank has been forced to extend the life span of its obsolete telling system and continuing servicing the remainder of its network pending delivery of the new Win/NT delivery platform.

From a user perspective the application design incorporated a number of "user friendly" quality characteristics required by the customer.

However, the project could not be considered as having a "quality" focus for the following reasons:

- An apparent lack of forward planning in the undertaking of this project with insufficient contingencies being allowed for in planning the project.
Failure to understand the risks, particularly the possible problems which may be encountered in meeting the project’s deadline, is evident. The complexity of the required “support technology” component required a more thorough analysis of whether or not it could support the “core technology” being supplied by the project.

• On the other hand, in setting of the scope and deliverables of the “core technology” the requirements should have been based on the ability of the delivery vehicle to support the application being developed.

• Being of a strategic importance to the future ability of the bank to provide enhanced service, the quality of the deliverables should have been the main driver of the project, not the end delivery date.

In hindsight it can be seen that rather than deliver a “state-of-the-art” system this project, instead of delivering more, delivered less, cost more and was never completed.

22. DISCUSSION

The model fitted Case Study One well in a most areas including:

• Top Management commitment was visible.

• Thorough researching of the necessity for the changes being introduced was undertaken
• The development process involved a dynamic rather than static approach to the project.
• Quality goals were attainable.
• A customer oriented approach to the development was adopted.
• Stakeholders, suppliers and end user involvement was evident.
• The system was fine tuned during the course of development to accommodate changed requirements.
• A validation stage was included in the process.
• A Post implementation review was undertaken.

The most noticeable negative aspect of this project was the overrun of the project budget.

The budget overrun in this case, however, was more as a result of poor budget planning than budget control.

The Quality model proposes more of an emphasis on value analysis and long term benefits in fitting a budget to a project.

• Project costings placing emphasis on potential value, rather than being based on a pay-back period should have enabled a more accurate estimation of actual project costs by taking into account costs and benefits of a qualitative as well as quantitative nature through conduct of a value analysis of the project.
Due to the re-engineering nature of the second case study it does not fit the model as easily as its predecessor. The model does fit well in some aspects of the project. These include:

- Adoption of a customer oriented approach in the gathering of initial requirements.
- End user involvement in validating the design.
- Parallel development of required system training.

The author considers that with this project senior management made a tactical response to a strategically important issue due to a failure of forward planning in replacement of the obsolete system.

Using the Quality model proposed in this thesis the prime business need of the project therefore would be the provision of a robust platform which would be capable of being upgraded to keep pace with advances in technology.

In specifying the requirements for the system care must therefore be taken to ensure that the limitations of the delivery vehicle are clearly understood.

The complexity of the system suggests that it may have been able to be addressed, in fact, as a staged release by concentrating on external customer requirements, which have shorter term effects, in the first release.
The organisation accounting and processing requirements should be looked at as a long term investment and thus could be included in an upgrade release which may also include enhancements due to advances in technology which occur during the life of the initial project.

It is suggested that by aligning the project in this manner the following issues would be addressed:

- Development time to deliver a quality working system would be shortened.
- The delivery vehicle and the system would provide up to date functionality.
- Benefits of the system would be gained sooner.
- Integration of changes to the system would not entail as complex an undertaking as the initially scheduled project.
- Smaller step changes are easier to control.
- Future changes in business and customer requirements could be more easily integrated.

23. CONCLUSION

Projects can and do fail even when all requirements are known. However Ward (1994) states that there has never been a complete disaster when all requirements were fully defined, documented, understood, and agreed on by all involved parties.
One of the problems, however, with projects introducing business system is that exact requirements for the system are rarely, if ever, initially clear. Due to the dynamic nature of customer needs and wants the quality of a business system depends not only on delivery of current customer requirements but also on its ability to adapt to changed circumstances.

In the banking environment the necessity to deliver new and more effective tools to employees to enable them to meet customer needs requires ongoing development of business systems.

Unless the systems, and their delivery vehicles produced, conform to the standards of quality demanded by their customers a bank is no longer able to effectively compete in the marketplace. The project management model proposed, and validated by examination of case studies, represents a practical way of ensuring that quality is built into a bank’s business systems.

In weighing the benefits and pitfalls of adopting a TQM approach to project management it must be stressed that the level of customer satisfaction supplied by a bank today is the major factor which contributes to its success in the marketplace.
23.1 Benefits

The benefits to be gained by the integration of TQM principles to project management can be categorized into:

- **External**

  Externally, the benefits include:
  - improvement in the quality of product / process delivered by projects: and
  - alignment of project activities with corporate policies, objectives and priorities.

- **Internal**

  Internally, the main benefits include:
  - a reduction in response and development times,
  - higher productivity and effectiveness,
  - greater job satisfaction for project staff, and
  - the significant benefit of reduction in total ongoing development costs.

23.2 Pitfalls

Although the benefits of integrating TQM practices with the management of projects is attractive the following overrides are critical:

- Adoption of TQM requires a never-ending commitment to improve everything that the organisation does.
Moving the business to a stage at which quality management becomes self-sustaining requires unending commitment, long-term capital investment, leadership, education and training.

- Even though an organisation may be eager to adopt TQM, short term pressures such as surviving in a volatile financial arena or fighting off the competition have a higher priority.

- TQM is based on the idea of continuous improvement achieved through small steps. A re-engineering project, with its aim of achieving rapid growth, also includes a higher risk factor which makes the implementation of TQM principles much more difficult.

- The successful introduction of TQM requires a careful balance between long-term cultural change activities and short-term activities designed to demonstrate that progress is being made and that measurable benefits are being achieved.

Failure to retain a critical mass during the transitional period is a sure recipe for a doomed TQM implementation program.
Implementation of Total Quality Management philosophies, not only to the field of project management, but to the whole of the organisation requires COMMITMENT to a customer focus. This commitment must emulate from senior management but must permeate throughout the organisation to be successful.

In a TQM focused project the goal is satisfy the customer, not the specifications. This goes right to the heart of business system projects, supplying end deliverables to fit the changes in customers' perception of their needs.

23.3 Further Research

This paper addressed the tailoring of business system projects by the integration of TQM principles.

The second project case study examined was linked, however with an organisational restructure being undertaken. The impact that the restructure of an organisation has on its ability to effectively manage projects is a considered an area which requires further research.
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