"Deployment of a Company Wide Quality Strategy in the Automotive Business"

EXECUTIVE SUMMARY

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Submitted in partial fulfilment of the requirements
for the award of Engineering Doctorate

Department Of Engineering
University Of Warwick

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ACKNOWLEDGEMENT

I declare that the project work described in this report was produced by myself, under the leadership of Mr A Curtis as Managing Director, Product Supply, Rover Group, and that none of it has been previously submitted for any academic degree. All sources of quoted information have been acknowledged by means of references.

Particular thanks are offered to Mr P A B Roberts (academic tutor) for his continued encouragement and direction; during the course of the project implementation, research and write up phases. Also, the role of Dr J M Cullen is acknowledged, who as Quality Director at Rover Group (1990 to 1997), provided the author with the initial inspiration, opportunity and leadership to carry out the project implementation within the company.

The author also acknowledges the experienced and efforts of many hundreds of Rover employee's involved in the development process for the quality strategy, and implementation of the new product introduction process methodology on new products, without whom, implementation would not have been possible.

Finally, the author recognises the encouragement received from his parents and family (Cindy, Sara and Gerald), whose patience during the programme is much appreciated.

ABSTRACT

Rover Group had began to address product quality in the 1980's, by collaborating with the Honda Motor Company, and commencing a *"Total Quality Improvement - TQI"* initiative. Whilst delivering initial improvement, it was not considered to be sufficient to sustain an organisational culture of ongoing improvement activity within the business.

A five year quality strategy was created, which identified improvement milestones for each of the key business processes that drive Rover Group. A significant deployment of the quality strategy is represented by Rover's new product introduction process, which led to the creation of Project Management Policy (PMP), and a series of processes constructed as a framework known as Common Business Environment (CBE). Implementation of PMP is achieved by the mandatory requirement for new product teams to conform to the *"six quality and reliability prescriptives"*, which are measured by adoption of a team-based self-assessment process and senior management review.

The Rover Group Quality Strategy demonstrates innovation in the conceptual model designed for its initial creation, and the deployment process by application of Group Judgement Theory, and the Japanese technique of *"Hoshin Kanri"* policy deployment. This represents a significant contribution towards the achievement of improved business results by Rover Group in aspects of product development lead time and quality.

INTRODUCTION

1. INTRODUCTION

1.1 Introduction To The Project

1.1.1 Project Features

The research and project work implementation described in this Engineering Doctorate Executive Summary; is presented as evidence of innovation regarding the deployment of a company wide quality strategy, within a major UK automotive company. This work led to the creation and implementation of further innovation, in the subject of new product introduction process methodology. The innovation framework applied during the project work is shown in Appendix 1.

1.1.2 Industrial & Business Context

Automotive manufacturers in the 1990's, competing in the global market are faced with increased levels of customer requirements, in terms of product performance and value for money. In particular, product quality and reliability is no longer perceived as an order winner, but merely an order qualifier. Today, customer dissatisfaction with product quality; which adversely affected Rover's market share and profitability in the 1970's and 1980's, leads to the harsher business realities of plant closures and forces withdrawal from the market place. Deming {1} recognised this with his now famous quotation that *"survival is not compulsory"*. The world wide automotive industry of the 1990's, is being subjected to the survival crisis, due to a scenario where production output from the 250 manufacturers, is forecast to be approximately 75% of available capacity as shown in Figure 1 {2}.

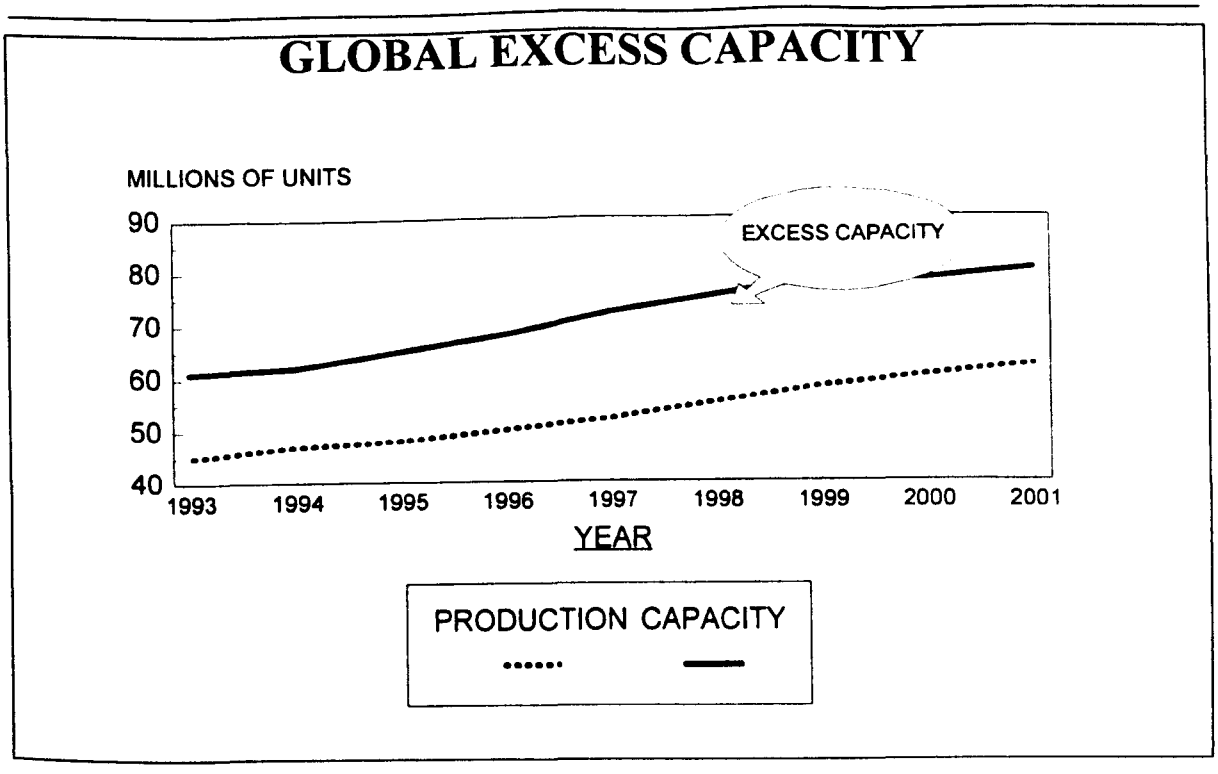
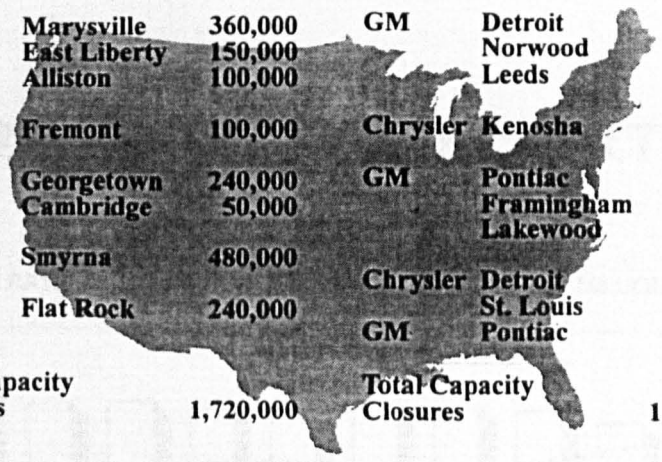


Figure 1:- Global Excess Capacity

Source - Automotive Industries {2}

This difference between the capacity and production output represents an equivalent of 85 manufacturing plants world wide, that could be threatened with the prospect of sitting idle. The implications of demand versus excess capacity had already affected the indigenous US automotive manufacturers who suffered plant closures during the late 1980's, leading to a production capacity reduction of c.1.8m vehicles, which matched the capacity of incoming Japanese transplant operations as shown in Table 1 {3}. The North American lesson posed a real threat to the UK automotive industry of the 1990's, with inward investment from Japanese companies (Nissan, Honda and Toyota), in the form of transplant European motor vehicle assembly operations potentially repeating this trend.

THE NORTH AMERICAN LESSON



IMPLANTS			CLOSURES		
Firm	Location	Capacity	Firm	Location	Capacity
Honda	Marysville	360,000	GM	Detroit	212,000
	East Liberty	150,000		Norwood	250,000
	Alliston	100,000		Leeds	250,000
Nummi	Fremont	100,000	Chrysler	Kenosha	300,000
Toyota	Georgetown	240,000	GM	Pontiac	100,000
	Cambridge	50,000		Framingham	200,000
				Lakewood	200,000
Nissan	Smyrna	480,000			
			Chrysler	Detroit	230,000
Mazda	Flat Rock	240,000		St. Louis	21,000
			GM	Pontiac	54,000
Total Capacity Implants		1,720,000	Total Capacity Closures		1,817,000

Table 1:- The North American Lesson

Source - The Machine That Changed The World {3}

1.1.3 Rover Group Context

As a major player in the European automotive industry, Rover Group is not immune from the demands of increasing customer expectations, and the seemingly never ending queue of foreign manufacturers lining up to provide additional capacity. The forecasts for capacity utilisation in Western Europe were 70% in 1995 rising slightly to 75% in 2000, as shown in Figure 2 {2}. Customers in the 1990's expect increased choice in terms of product specification, value for money and lifestyle statements offered by automotive branding. The purchase intent is more likely to be driven by these factors, rather than product quality and reliability.

Therefore, to ensure survival in the competitive 1990's, Rover Group needed to significantly enhance product quality and company image, merely to ensure a fighting chance of utilising its production capacity of approximately 500,000 units per annum.

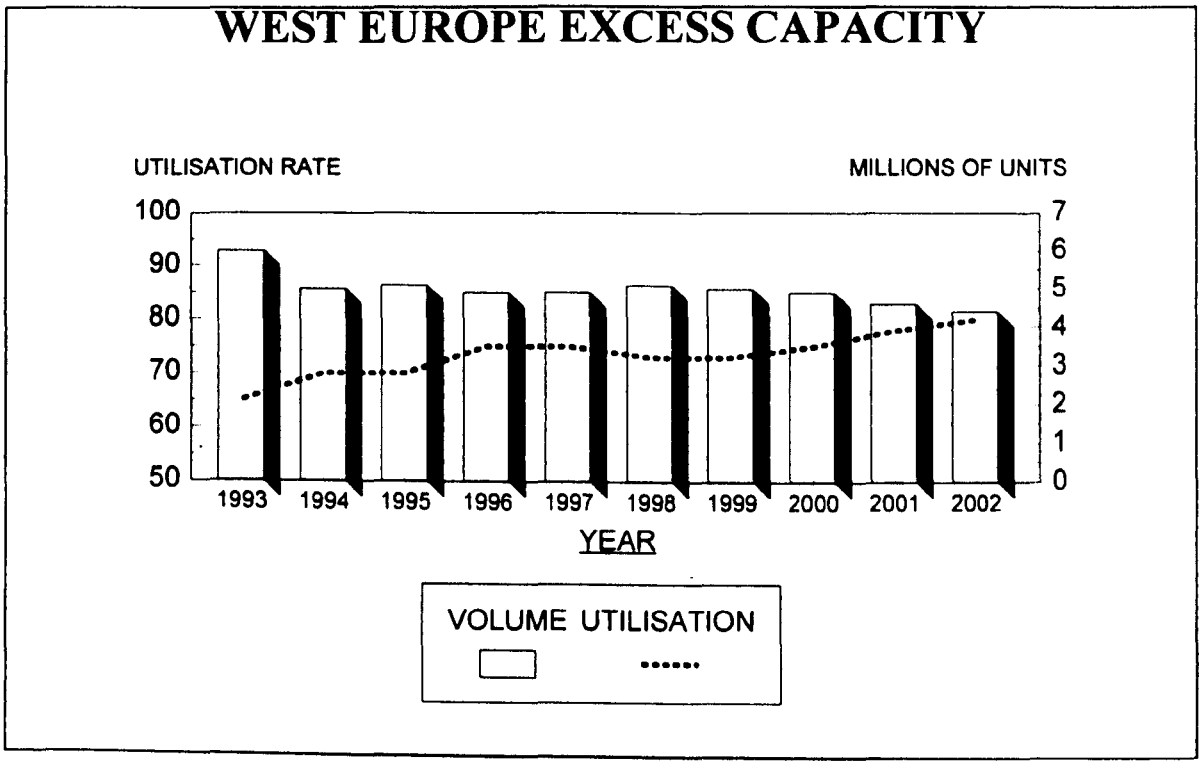


Figure 2:- West Europe Excess Capacity

Source - Automotive Industries {2}

1.2 Rover's Quality Performance

1.2.1 Background Scenario

In the case of British Leyland's passenger car division, Austin Rover (re-named Rover Group Ltd. from 1989), market share in the UK fell from 23.5% to 17.6% between 1978 and 1986, along with a reduction in total production volumes, as shown in Figure 3. The

company had also already been forced to withdraw from the US market once due to inadequate quality in the early 1980's (Rover 3500) {4} and would do so again ten years later (Rover Sterling).

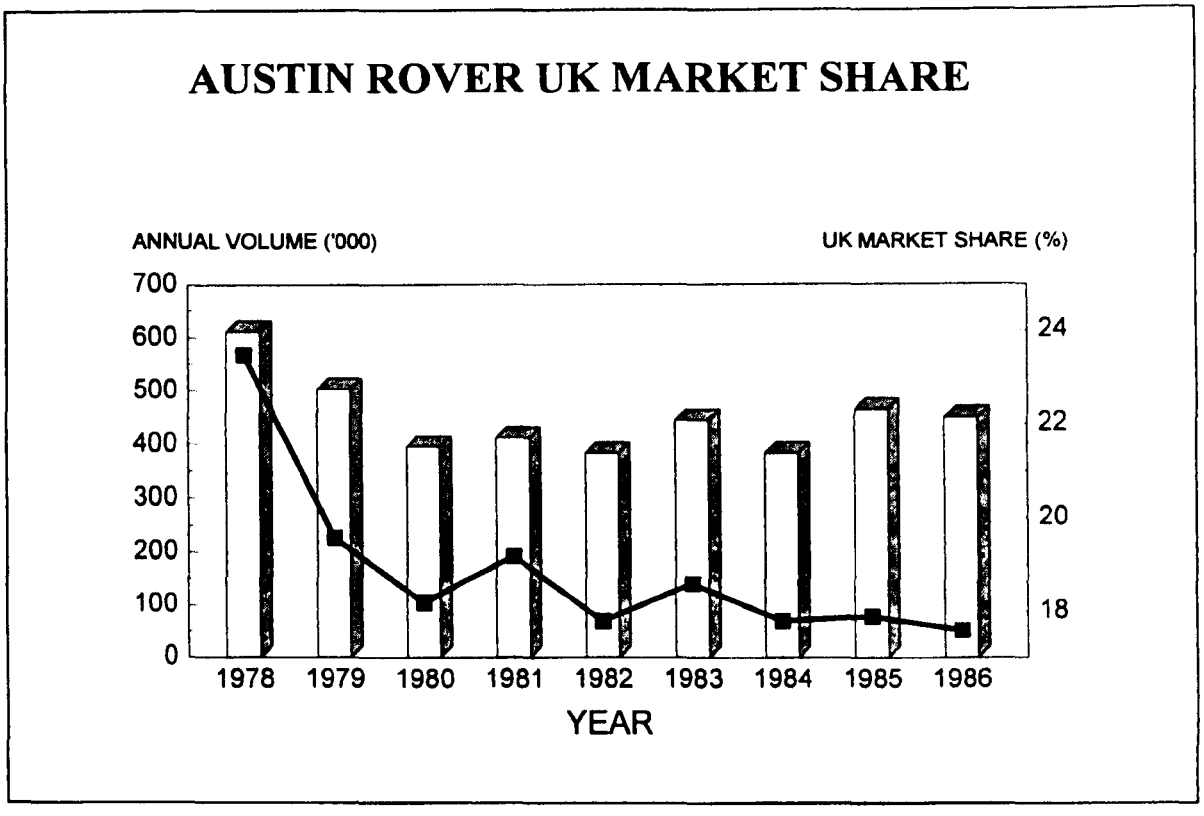


Figure 3:- Austin Rover UK Market Share

Source - The Breakdown Of Austin Rover {4}

This scenario of apparent failure was in the immediate period following the industrial relations, site rationalisation and product led revival of the company between 1978 to 1982. Rationalisation of the business resulted in factory closures and employees reduced to 87000 in 1982, half of the numbers employed in 1975 {5}.

In the subsequent years of the 1980's, products such as the new Metro, Maestro and Montego, manufactured by technically advanced manufacturing processes, were clearly refreshing the product image. Also improving management/labour relationships were leading to a scenario of reduced industrial disputes and general improvement of the company's image in the eyes of customers and the media. But these generic product and process improvements whilst necessary, were not sufficient in themselves. The projected demand for the new products was never realised, due to poor build quality and inadequate reliability, resulting in over capacity in manufacturing {4}. Figure 4 shows that, despite a general increase in customer satisfaction levels achieved by market competitors as measured on the industries New Car Buyers Survey (NCBS), Austin Rover was definitely falling behind in terms of *"overall satisfaction"* in the eyes of the customer {6}.

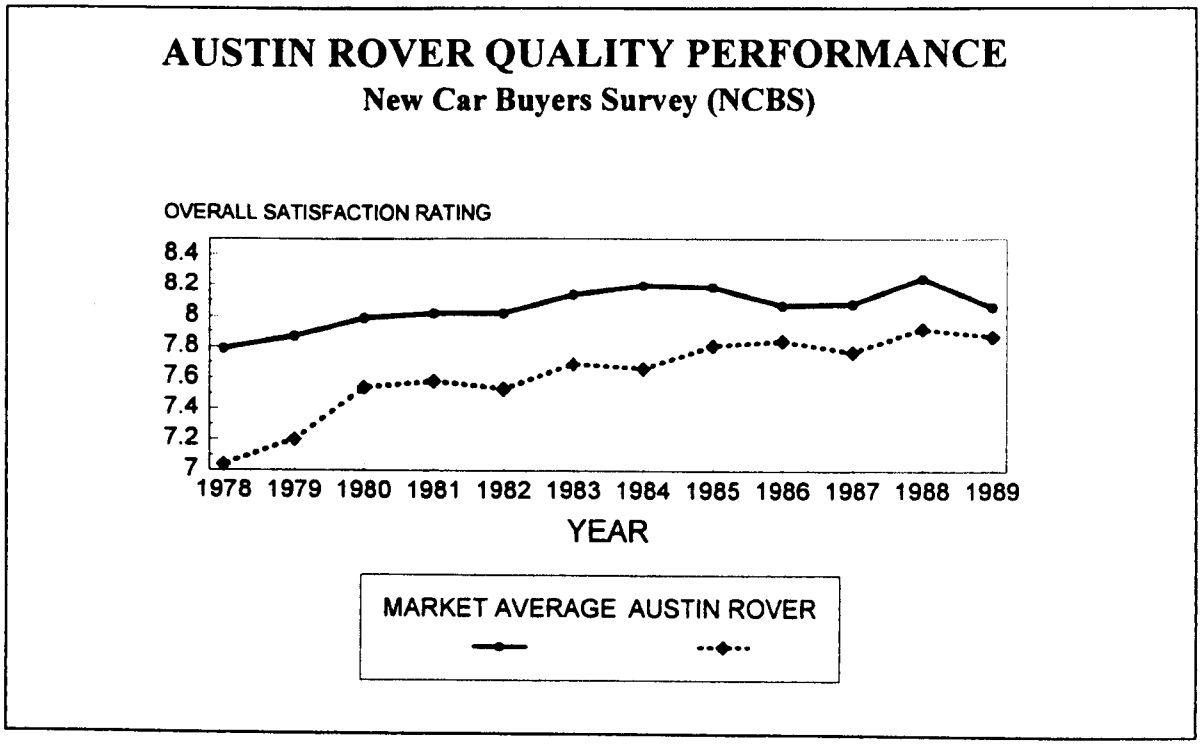


Figure 4:- Austin Rover Quality Performance

Source - New Car Buyers Survey {83}

Therefore, the revival strategy of the 1980's based on the cornerstone of refreshed products, industrial relations improvements and manufacturing process investment (£2.9 billion in total), whilst undoubtedly bringing the company *"back from the brink"* {5}, was not going to sustain business renewal and ongoing success for the 1990's.

1.2.2 Learning From Honda

Rover Group had already begun to address product quality performance in the 1980's, by collaborating with the Honda Motor Company on a number of product programmes, The Honda collaboration demonstrated initial product delivery success with the launch of the Triumph Acclaim in 1981, the Rover 213/216 in 1984, the Rover 800 in 1986 and the Rover 200 series in 1989; all demonstrated improved quality and reliability in the hands of the customer {6}. A number of major learning points were realised as a result of the Triumph Acclaim and Rover 213/216 and 800 projects {7}:-

- *The senior management team was convinced that the existing workforce could build a vehicle of a consistently higher build quality.*
- *A resistance to learn from Honda was building up at Austin Rover, probably based on misplaced nationalistic and company pride.*
- *The workforce interpreted the project as the start of a take over bid by Honda.*

1.2.3 Repositioning Rover Group

A market research exercise initiated in 1987 had revealed that the Austin brand was associated with products of low prestige and represented a high risk purchase in terms of product quality, reliability, residual values and customer service {8}. However, the Rover brand whilst also seen as a high risk purchase for similar reasons, still associated with

products of high prestige as shown in Figure 5. An initial diagnosis concluded that the company was attempting to compete by producing volume specification vehicles, at specialist manufacturer volume levels.

A strategy was developed that focused on creating a brand image for Rover cars, which would be positioned in the market place against the more discerning premium priced products, such as BMW, which had a similar volume base of 500,000 vehicles per annum.

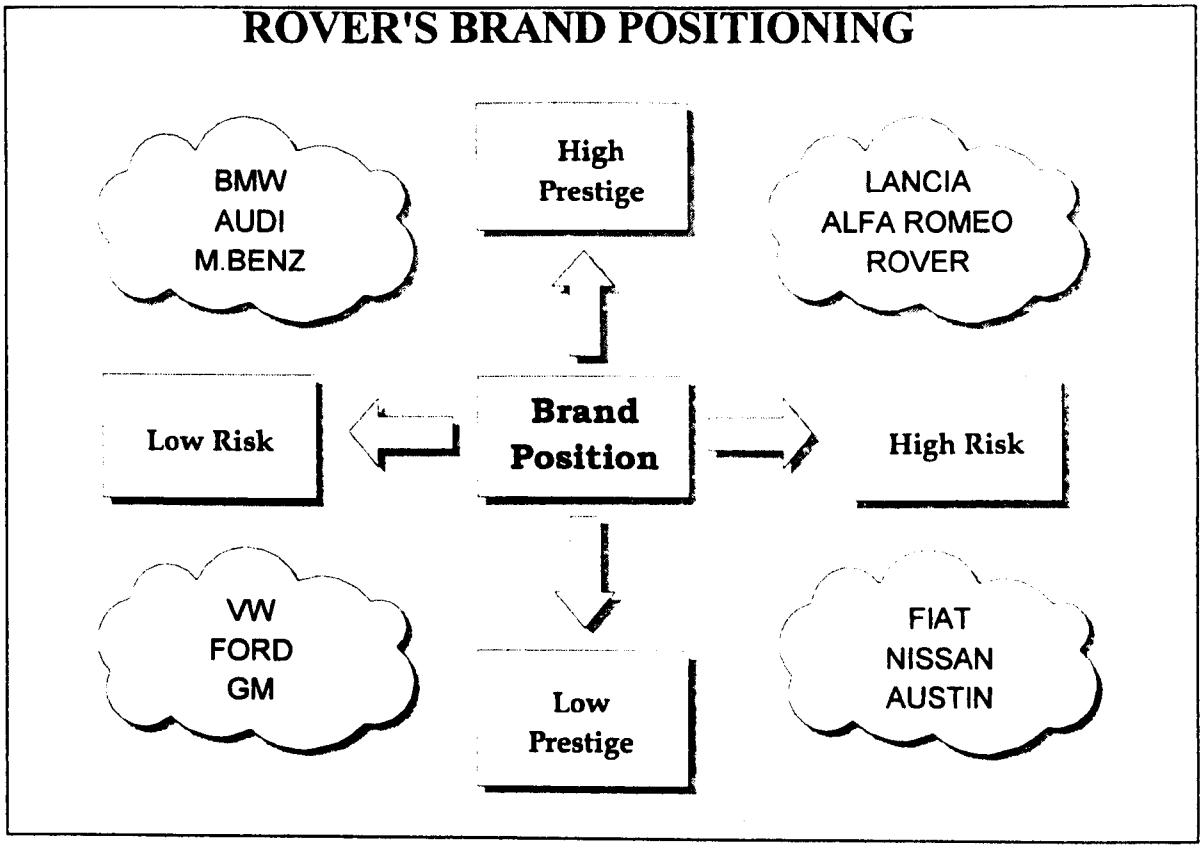


Figure 5:- Rover's Brand Positioning

Source - Internal Rover Group Study {8}

1.2.4 Total Quality Improvement Initiative

In 1987 Austin Rover's senior management team evaluated alternative proposals for harnessing the commitment of all employees which led to the launch of a *"Total Quality Improvement - TQI"* initiative {7}. The TQI initiative was essentially a company wide training programme which encompassed *"Total Quality Management - TQM"* training for the management population and a cascade approach for non-management employees.

The TQI initiative was based on a four stage transition model as shown in Figure 6, and assisted by PA Consulting Group's experience of TQM implementation over five years {9}.

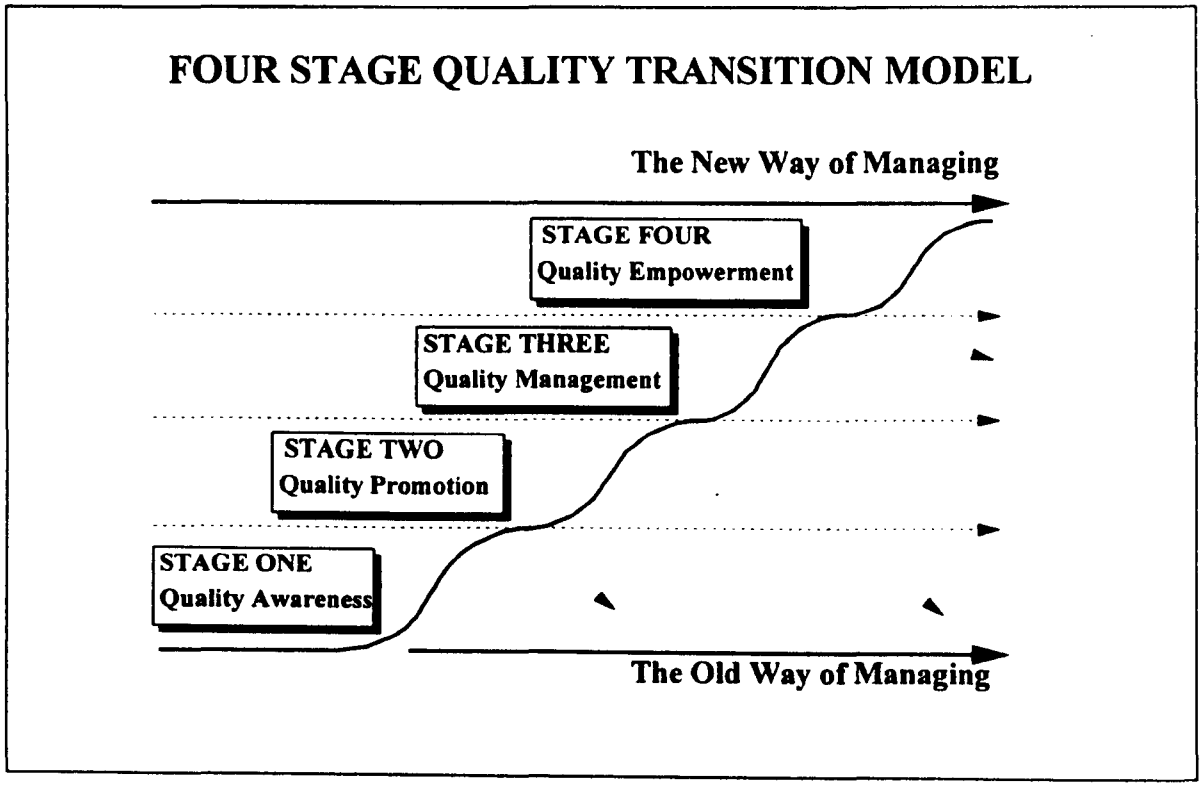


Figure 6:- Four Stage Quality Transition Model

Source - The Total Quality Experience {9}

This shows the four stages of quality transition as a methodology for aligning people within the organisation to achieve competitiveness. The aim is to strive for *"quality empowerment"* where everyone is engaged in planning and/or voluntary self sustaining improvement activity {9}. The rationale for the TQI initiative was to create the environment to enable the company to move into the high prestige/low risk sector defined in Figure 5, by producing higher quality products that would attract premium prices and deliver a higher return on investment.

The TQI training programme was completed in 1991, with the training of 37,000 managers and employees and achievement of company-wide employee participation in quality improvement at all levels throughout the organisation. TQI implementation was monitored by the Rover Group Quality Council (executive board of directors), through measurement of the adoption of basic tools of quality, internal customer contracts, suggestion scheme participation, measurement of process outputs and participation in quality action teams etc.

For example, in 1991 the company suggestion scheme received 14,000 ideas, which represented an involvement level of 36%, compared with the UK average of 5% and USA average of 12%. Also, in any one week during 1991 it was estimated that over 600 Quality Action Teams (QAT's) were in existence. With a typical team consisting of five to seven members, this translated to over 10% of all Rover employees actively involved in improvement {10}.

1.2.5 Rover Group Quality Strategy

The initial results of Rover's TQI programme were promising in terms of employee involvement in improvement activity through QAT's and the suggestion scheme etc. However, the quality journey was demonstrating a number of the classic elements of slow down, compared with the typical characteristics of end stage three and four from the model in Figure 6, as shown in Table 2. At stage four, the institution of quality has achieved maturity, to the extent that everyone in the organisation operates automatically along quality lines.

TYPICAL CHARACTERISTICS

End Stage Three	End Stage Four
■ All activities subject to one or two clearly defined overall corporate annual objectives. ■ Quality seen as an integral part of business. ■ Ownership of and control over all key business processes. ■ Greater partnership with smaller number of suppliers. ■ Integration of planning / vision / actions - vertically and cross-functionally. ■ All processes under control. ■ True reduction of inherent variability of a number of processes. ■ Alignment of functional activities. ■ Chief Executive audit system. ■ Significant use of Quality Function Deployment. ■ Increasing use of advanced statistical techniques.	■ Continual reduction in variability. ■ High levels of trust. ■ Self-monitoring. ■ Spontaneous self-motivated improvements (quality circles, cross-functional teams etc). ■ A learning organisation. ■ Full use of Quality Function Deployment. ■ 100% participation ■ Recognition by customers ■ True two way communication ■ Setting industry / sector / world standards

Table 2:- Typical Characteristics Of End Stage Three & Four

Source - The Total Quality Experience {9}

This is the state described in accounts of the most successful companies in Japan, where employees respond to questioners with a look of amusement which says *"but why would you do it any other way?"* {9}.

By stage four, much of the early formal quality apparatus has done its job, like a road map describing a by-now familiar route. Furthermore the nature of management has been transformed; it has undergone a change from being about directing (giving orders) to facilitating (creating an environment and providing resources to nurture bottom-up initiatives). It has also become inherently proactive rather than problem solving, with everyone looking towards ways of doing better tomorrow, rather than struggling to do adequately today.

Tools such as Business Process Re-engineering (BPR), Failure Mode Effects and Criticality Analysis (FMECA) and Statistical Process Control (SPC) methods will be developed and maintained to an advanced level. Real business results in the form of customer satisfaction indices, market growth and profitability, will be evident as a by product of the improvement activity. The company's image will be much enhanced as a result. It could be said that in reality end stage four, whilst achievable is never surpassed. Stage four is *"Total Quality"* : the aim is to reach it and maintain it indefinitely with continuous improvement a way of life.

The TQI programme at Rover whilst leading to an understanding of where management attention should be focused, included no strategy for ongoing implementation towards end stage four. For all of the examples of successful TQI activities, traditional short-term activities such as cost reduction programmes, achieving production volume, delivering product introduction programmes on time and achieving sales forecasts, were still the

predominant business measures. In short, the business strategy and associated measures were in direct conflict to the necessary conditions for success, and were still dominating the attention and time of management.

Research of successful TQM case studies had demonstrated that in most cases the companies have developed a long-term quality strategy based on a structured methodology, with defined goals and measures of success. Typically, the quality and business related measures for the company were one and the same. The Rover Group Quality Council concluded that the company required a quality strategy that would address the apparent shortfall with the TQI programme. The initial remit was to set about the task of defining a model for the Rover Group Quality Strategy, and create a strategy development process which incorporated novel implementation and review mechanisms, on a company wide scope.

1.3 The Main Themes

1.3.1 Project Justification

The central theme of the project work presented is based on the hypothesis that quality programmes based on TQI/TQM principles, generate improvement results that are greater than the effort initially expended. But that after a few years the effort required tends to far exceed the level of results achieved. A critical point is generally achieved where increased effort in an attempt to reverse a fall off in results, fails to stop the pay back, as shown in

Figure 7. At this point there is a real danger that the reduced results versus effort ratio starts to demotivate employees, particularly the senior management team who initiated the programme in the first place.

An organisation that progresses to the critical point is in a serious situation. The quality programme could actually stall at this point and prove to be immensely difficult, if not impossible to re-start. The most effective protection at this stage against the danger point is to be aware of its presence. It is an integral stage within the change process, and not necessarily a sign that something has gone drastically wrong with the programme. But awareness is vital, together with a strategy for resolution that re-energises the programme.

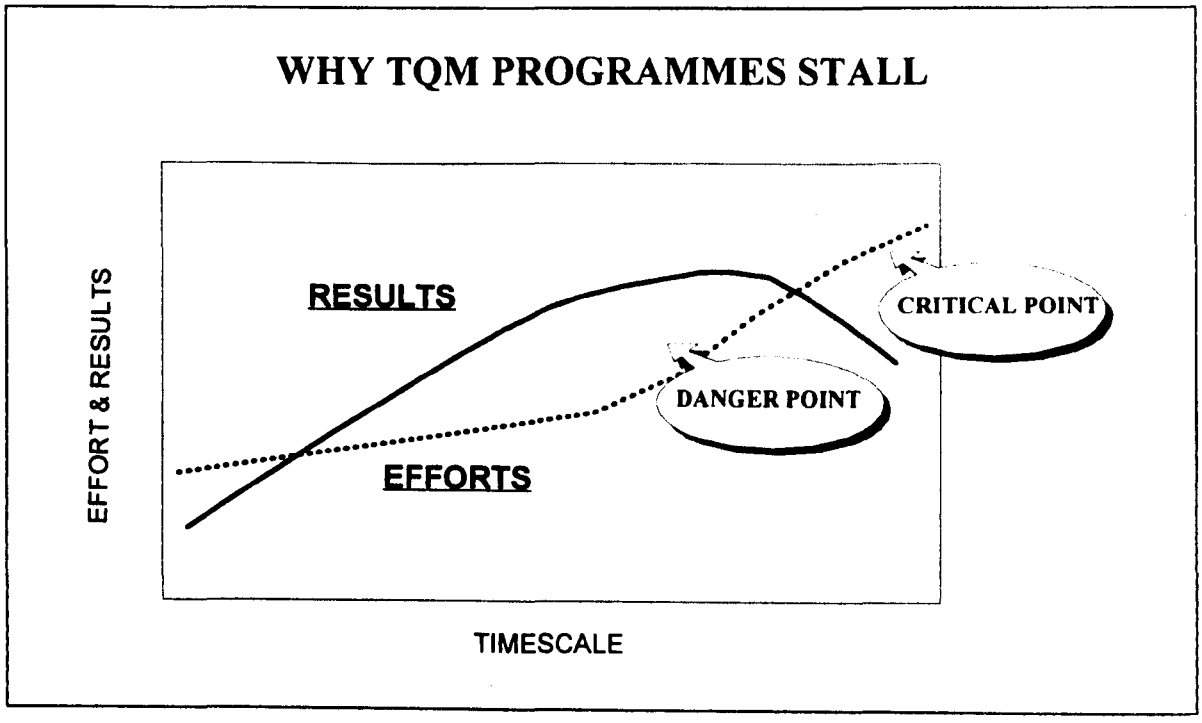


Figure 7:- Why TQM Programmes Stall

Source - The Total Quality Experience {9}

This was the position Rover was faced with in 1991 at the conclusion of the TQI training programme. Realisation of reaching this critical point, was the principal justification for the project to develop the Rover Group Quality Strategy.

1.3.2 Increasing The Momentum Of Rover's Quality Programme

The main theme was to increase the momentum of Rover's quality programme, by learning from the lessons of other companies' TQM successes and failures, and develop a robust quality strategy. The intent was to build upon the foundation of the initial TQM programme, and ensure that senior management commitment would be maintained within the business. The initial idea was to develop the Rover Group Quality Strategy, by creating a methodology that would enable strategic thinking to be applied to the strategy development process, and lead to an innovative approach for managing the business.

The industrial context and approach taken by Rover Group to implement TQM is discussed further in Project Report One.

1.4 The Structure Of The Project

1.4.1 Project Structure

The project work was conducted by the author at Rover Group Ltd. The author had already played a major role in the initial background work, concerning the TQI programme implementation in the late 1980's. The author was then recruited to create and develop the

initial quality strategy implementation methodology, working under the leadership of the Quality Strategy Director. Following this period, the author was requested to lead a team aimed at reviewing the *"New Product Introduction"* process at Rover. This resulted in a process re-engineering project that redefined the methodology for new product introduction in terms of process definition, implementation and measurement. The projects have been documented in six project reports, which include initial research, problem definition, methodology development and implementation at Rover.

During the course of project implementation, the author attended and presented project work at international conferences on quality and business process re-engineering. In addition, the overall programme scope was published as a case study in *"The TQM Magazine"* as a holistic methodology for improving quality and reliability in a major company.

1.4.2 Outline Of Project Submissions

The six project reports submitted into the Engineering Doctorate portfolio are as follows:-

- Project Report 1:- Quality Strategy Development.
- Project Report 2:- Quality Strategy Review.
- Project Report 3:- New Product Introduction Process.
- Project Report 4:- Common Business Environment.
- Project Report 5:- New Product Introduction Teams.
- Project Report 6:- Project Application & Results.
- Executive Summary.
- Personal Profile.

The Personal Profile provides an overview of the author's academic and industrial background prior to the Engineering Doctorate, and demonstration of competencies developed, as a result of taught modules attended at the University of Warwick and the project work implementation at Rover Group.

Seven additional submissions have been made to the portfolio as follows:-

- Tennant C, "Quality & Reliability Through Common Business Environment", TQM Magazine, The International Bi-Monthly for Total Quality Management, MCB University Press, Volume 7, Number 5, Page 7-15, (1995).

- Tennant C, "Quality & Reliability Through Common Business Environment", ICQR '95, International Conference on Quality and Reliability, Conference Proceedings Volume 2, Pages 215-222, Hong Kong, (11th-12th April 1995).

- Tennant C, "External Presentations & Papers", file containing a record of eleven conferences attended by the author at which presentations have been made summarising the project work completed during the Engineering Doctorate, (15th January 1995).

- Tennant C, "National Training Award Application", National Training Awards Office, (24th May 1994).

- Internal Rover Group Process, Policy For New Product Introduction, "Project Management Policy - PMP", Issue 3, (1993).

- Internal Rover Group Process, Policy For Reliability Management, "Reliability Management Process - RMP", Issue 1, (1993).

- Internal Rover Group Process, Policy For Design, "Design Methodology", Issue 1, (1993).

OVERVIEW OF THE SUBMISSIONS

2. OVERVIEW OF THE PROJECT SUBMISSIONS

2.1 Project Reports

2.1.1 Project Report 1:- Quality Strategy Development.

This report positions the quality crisis faced by Rover in the late 1980's in terms of poor product quality, in-effective process application, competitive pressures, falling market share and tarnished corporate image. Implementation of a Total Quality Management (TQM) programme re-focused the organisation and gained the *"hearts and minds"* of the people within the business, but was not in itself sufficient.

Research confirmed that businesses typically struggle to maintain momentum in their quality programmes, once the initial TQM training has been completed. The Rover Group Quality Council (executive board) faced up to this with the decision to develop a quality strategy, which declared the strategic intent of the business for the 1990's. Research into strategic planning philosophies and techniques led to the creation of a methodology for developing the Rover Group Quality Strategy, based on an adaptation of a group judgement method known as the *"Delphi Technique"*.

The quality strategy identified eighty-nine milestones against nine key business processes, to be achieved by 1995, and became the predominant corporate business plan aimed at taking the company towards world class levels in every aspect of the organisation. The

adaptation of the *"Delphi Technique"* as a strategic management tool to gain company-wide consensus, represents innovation in the area of company-wide quality planning in a major European automotive manufacturing company.

2.1.2 Project Report 2:- Quality Strategy Review.

This report describes how following research of management theory, application of a Japanese technique for policy deployment, known as *"Hoshin Kanri"* was selected for implementing and reviewing the Rover Group Quality Strategy. Hoshin Kanri has been extensively applied in Japanese industry, and has been the subject of limited applications in the USA, yet no extensive company-wide applications in European industry have been published.

Following initial communication of the quality strategy, a major review process was developed and implemented, to test the effectiveness of deployment across the breadth of the organisation, down to all levels. The management review process was developed as a formal measurement structure, aimed at identifying the major issues facing Rover in its quest to become world class. The quality strategy reviews resulted in the quality strategy being re-issued on an annual cycle, with revised milestones and measures. Longevity and corporate commitment to the Rover Group Quality Strategy is demonstrated by its seventh iteration, which now includes improvement milestones up to the millennium. Application of

"Hoshin Kanri" as a methodology for quality strategy deployment, and creation of iterative management reviews, represents innovation for a major Western automotive manufacturer.

2.1.3 Project Report 3:- New Product Introduction Process.

This report describes how the initial management review of the quality strategy, resulted in the author leading a significant business process re-engineering project on one of the nine key business processes: new product introduction. The scope for new product introduction at Rover is defined as *"the process by which a market opportunity is identified, a product developed, facilitised and launched to exploit the opportunity"*.

Research into new product introduction processes identified critical issues of management leverage, simultaneous engineering philosophies, process efficiency metrics and methodologies for describing the new product introduction process. A strengths and weakness analysis of Rover's process, which represented significant learning from the Honda collaboration in the 1980's, was carried out and led to the creation of *"Project Management Policy - PMP"*. The adapted group judgement *"Delphi"* technique created for the quality strategy, was applied to develop a clearly defined methodology incorporating checklists and success criteria. PMP was implemented on new product programmes at Rover, by application of a change management strategy known as *"Focused Learning"*.

A key principle of PMP is to provide regular up-dates of new best practice obtained from the experience of product programme application, to ensure that the process remains competitive. PMP is currently on its fourth iteration following implementation on two cycles of product delivery. Achieving significant change management in product delivery performance at Rover, through the definition and deployment of PMP, including a process of self-renewal owned by the product project teams, represents innovation in new product introduction in the Western automotive industry through robust deployment of Hoshin Kanri principles.

2.1.4 Project Report 4:- Common Business Environment.

This report describes further development of PMP as a methodology for application of tools and techniques, known as *"Common Business Environment - CBE"*. The background to CBE was a series of previous initiatives, which were aimed at improving product delivery performance (lead time, cost and quality) but yielded superficial levels of success, particularly in the areas of implementation.

Research into tools and techniques application within the new product introduction process, concluded that whilst the methods are numerous and well documented, companies do not always enjoy successful application. This is often because the application is being driven by a contractual requirement from supply base customers, rather than as a result of an internal strategy, together with a general lack of senior management commitment and

understanding. To be of significant benefit, the tools and techniques must be applied at an early stage of the new product introduction process, so as to gain maximum leverage of the strength of influence at the front end of product programmes. This requires identification of organisational attributes and activities relevant to the company, and achievement of mutual alignment and synergy.

The research led to the development of CBE as an all encompassing framework, for embracing the implementation of tools and techniques complementary to PMP. Two significant processes are described: Rover Design Methodology and Reliability Management Process. These present a mechanism for improving decision making within new product introduction, through the adoption of Design Decision Records (DDR's) and the Reliability Management and Control Document (RMCD). The CBE framework received senior management endorsement in the establishment of the *"six quality and reliability prescriptives"* , which were incorporated as a milestone within the Rover Group Quality Strategy.

The implementation of the CBE framework directly from the quality strategy through Hoshin Kanri principles, as a methodology for improving the Rover's new product introduction performance, represents innovation in deployment of a Western company's key business process.

2.1.5 Project Report 5:- New Product Introduction Teams.

This report describes Rover's approach to organising and measuring new product introduction teams. The background stems from a traditional product engineering organisation applied in the 1980's, based on central functions and matrix management techniques. The organisation was subsequently transformed into autonomous project teams in the early 1990's, as a means of improving product delivery focus and performance. A major organisational review carried out in 1994, identified improvement opportunities for a more effective and efficient, team based organisation of the new product introduction process.

Particular attention was taken to understand how Rover could further develop a culture of engineering and technical specialism, without compromising the deployment of PMP and the CBE framework. This led to the creation of project teams based on a core Project Nucleus supported by engineering *"Areas Of Specialism - AOS"*.

Research was carried out to compare this approach taken at Rover, with the automotive industry in Japan and the USA. The author created a rigorous project team self-assessment methodology, for measuring compliance with the six quality and reliability prescriptives, and to provide opportunities to improve PMP. This was developed based on the techniques pioneered by the Malcolm Baldridge Quality Award (MBQA) in the USA, and the European Foundation for Quality Management (EFQM) award.

2.1.6 Project Report 6:- Project Application & Results

This report describes examples of quality strategy deployment through the new product introduction process milestones, by Hoshin Kanri principles. Examples are provided of product delivery performance, both prior and post the adoption of PMP and application of CBE tools and techniques, such as Design Methodology and Reliability Management Process. The hypothesis suggested is that Rover product programmes that have applied PMP, have been delivered in shorter time scales and at higher levels of initial launch quality. The implementation of PMP and Common Business Environment by *"Focused Learning"* was submitted for a UK- National Training Award, in 1994 and was acknowledged as *"an imaginative, comprehensively designed and thoroughly managed initiative on a substantial scale"*. The Rover Group Quality Strategy, Project Management Policy and Common Business Environment were comprehensively described in Rover's successful application for the UK Quality Award in 1994.

2.1.7 Quality & Reliability Through Common Business Environment.

This paper was prepared by the author as a holistic summary of the Engineering Doctorate project work. The abstract described how quality strategy milestones for new product introduction were being delivered through a process framework known *as* "Common Business Environment". The paper was accepted for publication within the proceedings of The First International Conference on Quality and Reliability, held on 11th to 12th April 1995 in Hong Kong, at which the author presented the paper. It was later published in The

TQM Magazine, the International bi-monthly for Total Quality Management, in October 1995. The editor for TQM magazine (Dr J Peters) described the paper as: *"one of the best co-ordinated initiatives in UK industry. The planned and accomplished close linkage of strategic objectives with a host of production processes is detailed in the paper. The section on focused learning has powerful lessons for all businesses"*.

2.1.8 External Presentations & Papers.

This file contains a record of eleven international conferences attended by the author, at which presentations have been given summarising the work over the period of the Engineering Doctorate. A summary of seventy two slides is included, which have been used as presentation.material by the author.

2.1.9 National Training Award

This application for a National Training Award was prepared and submitted to the National Training Awards Office by the author.

2.1.10 Internal Rover Group Processes

A number of internal Rover Group process documents have been submitted into the portfolio. These include Project Management Policy (PMP), Reliability Management Process (RMP) and Design Methodology.

2.2 Order Of Reading The Submissions

The portfolio submissions are presented in a chronological order, from Project Report One to Six. The additional submissions are the Executive Summary, Personal Profile, "Quality & Reliability Through Common Business Environment" paper, the External Presentations and Papers file, the National Training Award application and the internal Rover Group processes for PMP, RMP and design methodology.

The suggested reading order is to review the published paper; to gain an overview of the scope of the Engineering Doctorate portfolio, review the presentations and papers file; to determine the level of Internationalism of the author's presentations and then to read the six project reports in the chronological order. Each project report references the internal Rover Group processes as appropriate.

THE RESEARCH PROCESS

3. THE RESEARCH PROCESS

3.1 Scope Of The Study

The objective of the research study was to identify published material, relevant to the subjects covered within the individual projects. The scope of the research included an initial holistic view of the key issues within the world-wide automotive industry in terms of rising customer expectations, excess production capacity and the context in which Rover Group existed. This was used to demonstrate the basic justification for the project work. The research was then extended to establish academic knowledge, critically review industrial application within the scope of the projects, in order to create new methodologies for application at Rover Group. The main boundaries of the research were established as a broad review of the management of quality programmes and the new product introduction process, with a particular emphasis on industrial application.

A study of approaches for successful strategic management and benchmarks for quality strategy implementation (including case studies), was included to create the methodology for developing the Rover Group Quality Strategy. This led to an investigation of generic management philosophy and techniques to establish the management review process for the quality strategy. A literature search of applications of the techniques for policy deployment, was carried out to compare and contrast published work with the approach taken at Rover. A review of new product introduction processes, including academic conceptual models and

industrial examples, was carried out to establish and critique the main issues. This was complemented by exploring available quality and reliability tools and techniques as applied in industry for potential application within the new product introduction process at Rover. Cause and effect relationships were critically examined, to establish organisational attributes for successful application of quality and reliability techniques within industry. This was used to develop and implement the project for re-engineering the new product introduction process at Rover.

Finally, research into organisations, new product introduction teams and team measurement methodologies was carried out to compare and analyse Rover's progress in this area. This led to an organisation review at Rover and development of a new management assessment process for new product introduction.

3.2 Research Methods

3.2.1 Research Methods Considered

Various research methods were considered during the course of this Engineering Doctorate, in order to establish the level of subject matter academic and industrial status. This served three main purposes; to establish academic knowledge, to critically review industrial application, and to create new methodologies for application at Rover. The research methods consisted of three main sources; reading published work in the form of academic

and business books, attending International conferences, and carrying out a literature search of published literature and theses.

3.2.2 Academic & Business Books

Academic and business books were reviewed, to develop an understanding of the main theoretical concepts and level of industrial application, concerned with the project work. This important comparison provided a basis for carrying out a critical review of written work versus actual business implementation. This allowed an interpretation to be developed, to ensure that the project implementation at Rover took account of the conceptual models, whilst learning from the success and failures of comparative businesses.

3.2.3 Attending International Conferences

The author attended and gave project work presentations at eleven international conferences, which are listed in Appendix 2. The conferences included subject matter concerning Total Quality Management (TQM) principles and implementation, quality and reliability, business process re-engineering, automotive lean product development and project management. The conferences were International in context and geography, including venues in London, Holland, Finland, Strasbourg, Singapore and Hong Kong . The material obtained was in the form of discussions with other presenters and delegates, questions arising from the author's presentations, and conference proceedings. This was used by the author as research material for project submissions, to complement the academic research carried out.

3.2.4 Literature Search

A literature search was carried out of published literature and registers of theses. Five major databases were examined, to collect research material for the project implementation and Engineering Doctorate portfolio project submissions. These were as follows:

- *Index to Theses.*
- *Ei Compendix *Plus.*
- *Ei Page One.*
- *Social Sciences Citation Index.*
- *Institute of Management International Database Plus.*

The database search was carried out primarily to identify research material to develop new methodologies for implementation at Rover Group. This included the application of Hoshin Kanri Policy Deployment across the world, applications of Group Judgement techniques such as Delphi and Social Judgement, and new product introduction process application.

The key words used in searching included combinations of the following terms: Hoshin Kanri, policy deployment, Delphi, quality strategy, quality and reliability.

RESEARCH OVERVIEW & KEY ISSUES

4. RESEARCH OVERVIEW & KEY ISSUES

4.1 Total Quality Management

Many companies have demonstrated links between TQM and improved business performance; a notion fuelled by high profile attention from the Malcolm Baldridge Quality Award in the USA, and the European Foundation For Quality Management. Yet *"reputedly 80% of TQM programmes fail"*, {11}, because *"they have passion without systems, or systems without passion"* {12}. Business rationalisation due to economic recession and competitive pressures, has forced companies to review their TQM strategy, leading to the hypothesis that implementation of TQM and downsizing the corporation are not contradictory {13}. However, Juran stated that *"the major purpose of quality improvement is to reduce the amount of work that is being done as a result of poor quality"* {14}. This conflict of interests must be addressed by management establishing a plan that provides an acceptable level of assurance to employees, that reducing rework will not lead to job losses.

Important features which contribute to improved performance as a result of TQM programmes must be addressed by top management, as shown in Table 3 {15}. A conclusion from the research was that the greatest leverage in a TQM programme, could be obtained by developing a strategy that sets the direction and priorities for the whole business. Also, top management should demonstrate commitment to the quality programme, by implementation of a strategic approach to quality management.

IMPORTANT FEATURES	MAIN PRIORITY
Customer satisfaction	Critical in order to remain competitive in the market place. Need to understand customer needs and develop effective processes
Top management leadership	Active leadership to establish quality as a value incorporated into the company's management philosophy
Quality concepts	Need to be clearly articulated and thoroughly integrated throughout all activities of the company
Corporate culture	Must involve all employees in contributing to quality improvements
Employee involvement	Should focus on teamwork and training at all levels in order to strengthen employee commitment to continuous improvement
Systematic approach	Gathering, evaluation and acting on facts and data
Supplier involvement	Need to be made full partners in the quality management process.

Table 3:- Important Features Of TQM

Source - US Companies Improve Performance Through Quality {15}

A critical review of TQM programmes in industry is discussed in Project Report One.

4.2 Strategic Planning

There are no substitutes for strategic planning, as shown by the number of successful Japanese companies, who have demonstrated that their quality programmes are based on long term plans. Strategic planning needs to *"relate the company to its environment"* {16}, and *"integrate an organisation's major goals, policies and action sequences into a cohesive whole"* {17}.

Company strategy can be segregated into four elements of; *"business, divisional, group and corporate"* and is concerned with the direction a company takes over time; the use of its available resources, analysis of strengths and weaknesses, and the opportunities and threats

in its particular environment {18}. The process of formulating strategy inevitably differs considerably among companies, due to the type and size of the business, its structure and its style of leadership. There is a usually a *"considerable time lag between recognising the need for a strategy review and the improved performance which the action programme seeks"*. Therefore, plans that reach out over a five or twenty year time frame could both be considered long term {18}.

Two contrasting approaches to strategy are considered; the first centres on the problem of maintaining strategic fit to match available resources, whilst the other centres on the problem of leveraging resources to reach seemingly unattainable goals. The two are not mutually exclusive, but represent a significant difference in emphasis {19}. Companies that have risen to global leadership over the last twenty years, invariably began with ambitions that were all out of proportion to their resources and capabilities, by adopting a methodology for strategic planning termed *"strategic intent"* {19}.

Practitioners of this concept and their strategic intent include; Komatso (Encircle Caterpillar), Canon (Beat Xerox), Honda (Become A Second Ford) and Toyota (To Beat Benz), and were based on five critical elements as shown in Table 4 {19}.

ELEMENT	RATIONALE
Create a sense of urgency	Amplify weak signals in the environment that point up the need to improve, instead of allowing inaction to precipitate a real crisis.
Develop a competitor focus at all levels	Every employee should be able to benchmark his or her efforts against best in class competitors so that the challenge becomes personal.
Provide employees with new skills	Training in problem solving, team building, statistical tools etc.
Give the organisation time	If competing initiatives overload the organisation, middle managers often try to protect their people from the whipsaw of changing priorities on a wait and see basis.
Establish clear milestones and review mechanisms	The goal is to make the challenge inescapable for everyone in the company and ensure that internal recognition and rewards reinforce desired behaviour.

Table 4:- Five Stage Approach For Strategic Intent

Source - Strategic Intent {19}

Regardless of the approach taken for strategy formulation the requirement *"to integrate and develop a more systematic approach to setting strategy with mechanisms for communicating strategy to those who have to carry it out"* is fundamental {20}. To be effective, strategic planning must use a proper process, *"because strategy should not be separated from implementation"* and the strategy communication process should aim *at "maintaining consistency among managers across all levels in the organisation"* {21}.

Conclusions drawn are that an effective strategic plan can be developed according to contrasting approaches, but must concentrate on active participation during the development process, and conclude with the detailed actions that are to be carried out. Finally, the process

by which plans are reviewed, represents a significant opportunity for ensuring that the planning process remains healthy.

A review of strategic planning methodologies is presented in Project Report One.

4.3 Quality Strategy In Industry

Rank Xerox (winner of European Quality Award in 1993) developed their quality strategy by concentrating primarily on applying quality processes to the management of the business. Three processes described as; management, core business and infrastructural were defined within a business architectural model known as *"Rank Xerox 2000"* {22}. Motorola developed their quality strategy, based on achievement of best in class levels of people, technology, product, manufacturing and service {23}. The company placed major emphasis on the achievement of *"6 sigma quality"* which requires process capability levels across all business processes of the order of 3.4 parts per million defects. IBM have created a quality policy, vision, quality goals that are deployed throughout the business to individual departments. Six critical success factors have been identified to implement the vision and to achieve the strategic goal of being the *"undisputed leader in customer satisfaction"* {23}.

The Cadillac division of General Motors developed a quality strategy based on a five stage business planning process known internally as *"Aligning the Arrows"* {23}. The strategic objectives were based upon reasonable quantifiable statements about what the company

should achieve within a ten to fifteen year horizon, translated into business objectives, goals and action plans. The basis of this approach was to develop action plans which represent detailed steps that needed to be taken in order to accomplish the goals.

Caterpillar developed a quality strategy supported by detailed milestones as identified in an eight point quality programme, known as *"Total Quality System - TCS"* {24}. For each of the eight points there is a scoping statement, a 1991/2 main objective and milestones for each year from 1982 to 1988, set out in a quality plan.

Companies that have achieved significant business results include Harley Davidson (recaptured market share, and reduced rework by 70%), Xerox (achieved a 78% decrease in defects), and Cadillac (reduced warranty costs by 30% and defects by 60%) {25}. These companies had all developed characteristics within their TQM programmes which can be summarised as a twelve step implementation plan. Of the twelve steps, four were seen to be absolutely vital for continued success; prepare gap analysis, develop a strategic quality plan, create measurement systems and set goals, review and revise the strategy.

4.4 Business Processes

Deming stated that *"I should estimate that in my experience, most troubles and most possibilities for improvement add up to proportions to something like 94% that belong to*

the system (process) and only 6% to special causes, management's job is to develop the business processes" {26}. It is also suggested that *"there is no product and/or service without a process and no process without a product or service"* {27}. This leads to the conclusion that *"in all companies there are literally hundreds of business processes in operation every day. Over 80% of them are repetitive, things that are done over and over again"* {27}.

Business process improvement has been declared as *"the breakthrough strategy for total quality, productivity and competitiveness in the 1990's"* {27}. Throughout the 1980's, most companies focused their major efforts on correcting and improving their production processes (representing less than 10% of the product value), whilst leading businesses realised that focusing on a methodology of business process improvement was the way forward. Table 5 shows a methodology for business process improvement {27}.

PHASE	OBJECTIVE
Organising for improvement	To ensure success by building leadership, understanding and commitment
Understanding the process	To understand all the dimensions of the current business process
Streamlining	To improve the efficiency, effectiveness and adaptability of the business process
Measurement and control	To implement a system to control the process for ongoing improvement
Continuous improvement	To implement a continuous improvement process

Table 5:- Phases Of Business Process Improvement

Source - Business Process Improvement {27}

Business processes can alternatively be viewed from a re-engineering, rather than improvement perspective, implying a more radical philosophy *as "the fundamental rethinking and radical redesign of business processes to bring about dramatic improvements in performance"* {28}. Table 6 summarises process re-engineering principals.

KEY WORD	IMPLIED DEFINITION
RADICAL	Going to the root of things and throwing away and starting over, beginning with a proverbial clean slate and reinventing how you do your work
REDESIGN	About the design of how work is done based on the premise that the design of the process is of essential importance critical to the execution of high quality work
PROCESS	A group of related tasks that together create value for the customer, but the customer is only concerned with the process output, not the individual series of tasks
DRAMATIC	Making quantum leaps in performance, achieving breakthroughs. Not merely achieving marginal improvements to the business

Table 6:- Business Process Re-engineering Definition

Source - The Re-engineering Revolution {28}

Business process re-engineering requires *"re-engineering leaders"* who act as the motivation and spiritual adviser of the re-engineering programme. The leader should appoint process owners; sets their goals, give them the authority, the resources and the incentives they need in order to succeed.

4.5 Management Theory

Management theory can be characterised into elements of organisational, forecasting, planning, setting objectives, implementing change, employee motivation and business results. Taylor developed *"scientific management"* by which he meant systematic

observation and measurement {29}. Drucker took the view that it is not realistic to think of an enterprise as having a single objective stating that *"efficient management always involves a juggling act, balancing the different possible objectives, deciding the priorities to be put on the multiple aims that an organisation has"*, and proposed the concept of Management By Objectives (MBO) {30}. The objectives should spell out the contribution that the manager will make to the attainment of company goals in all areas of the business. For managers to improve their performance and take proper advantage of the MBO, they must be given direct information which will enable them to measure and evaluate their own achievement. The existence of objectives emphasises the contribution that each individual manager makes to the total group operation.

Kanter found a crucial distinction between organisations that can and do innovate, and those whose style of thought is against change and prevents innovation {31}. Innovative firms have an integrative approach to problems and are willing to operate at the edges of their competence. They do not measure themselves by the standards of the past, but by their visions of the future. They contrast very strongly with firms with a *"segmentalist"* approach, where little or no effort is given to the problem as an integrated whole. Fayhol suggested that all activities within industrial organisations could be divided into six distinct groups such as technical, commercial, financial, security, accounting and managerial {32}. He described a framework of five steps for managing the business as; to forecast and plan, to organise, to command, to co-ordinate and to control. Therefore, Fayhol proposed the notion that *"people engaged in similar activities must have the same objectives in a single*

plan". Mintzberg identified ten managerial roles which can be grouped into three areas; interpersonal, informational and decisional {33}. Mintzberg views managers as people who deal in the here-and now; whose work is grounded in the daily dealings of the organisation, in an unprogrammed as much as in a programmed fashion.

Peters developed a set of concepts to focus on what happens in the process of organising which became known as the McKinsey 7-S framework {34}. On the basis of this framework, a set of eight attributes that characterised all excellent innovative US companies was developed. The findings underlined the principle of excellent companies being above all, *"brilliant on the basics"*. They do not let techniques substitute thinking, nor analysis impede action. They work hard to keep things simple in a complex world. They tolerate some chaos in return for quick action and regular innovation. Burns describes two *"ideal types"* of management organisation that represent the extreme points of a continuum along which most organisations can be placed {35}. The mechanistic type of organisation is adapted to relatively stable conditions, whereas, the organismic organisation is adapted to unstable conditions when new and unfamiliar problems continually arise which cannot be broken down and distributed among the existing specialist roles.

Herzberg relates the task of managing the business to the related motivational effects on employees, describing job dissatisfiers as *"hygiene factors"* {36}. He concludes that a lack of adequate hygiene conditions will cause dissatisfaction, but their presence will not of

themselves cause satisfaction. For management the challenge is to identify the motivators, provide adequate hygiene through company policy, technical supervision and working conditions. Most motivational theories take the existence of the effort-performance link for granted, if they consider it at all.

The approach of motivational theory can be developed further as expectancy theory {37}. This emphasises the importance of the relationship between effort and reward, and suggests that there will be little motivation if the link between *"effort"* and *"performance"* is weak. The main factors affecting the strength of the link include; ability, resources, and clarity of objectives. Crosby states that *"many companies are very tentative about measurement, they often look on it as the ultimate hassle, however, the hassle comes from not having clear measurements, measurement is just the habit of seeing how we are going along"* {38}.

Business measures are generally contained within monthly reports which are by definition reflective, in that they indicate past performance. Myron Tribus (ex Technical Director of the Rank Xerox Corporation) stated that *"managing a company by means of the monthly report is like driving a car by looking in the rear view mirror"*.

A discussion on management theory is presented in Project Report Two.

4.6 Kaizen Methodology

The Japanese approach of Kaizen, which translated means " *the gradual, unending improvement, doing little things better, setting and achieving ever-higher standards*" {39}. Critical to effective implementation of Kaizen is the understanding of the major components of job functions by apportioning them into levels, particularly those of management positions. "*In Japan, management has two major components: maintenance and improvement. Maintenance refers to activities directed towards maintaining current technological, managerial and operating standards, Improvement refers to those directed toward improving current standards*", as shown in Figure 8 {39}.

It can be seen that more senior managers are responsible for both innovation and continuous improvement, whereas junior levels tend to focus on maintenance and continuous improvement.

The important factor is the recognition of all three elements coupled with a focus for management attention on each that overlaps in the arena of continuous improvement. This is the cornerstone of Kaizen as an effective deployment strategy for leading the business of satisfying customers, maintaining and growing market share whilst providing and effective return on investment.

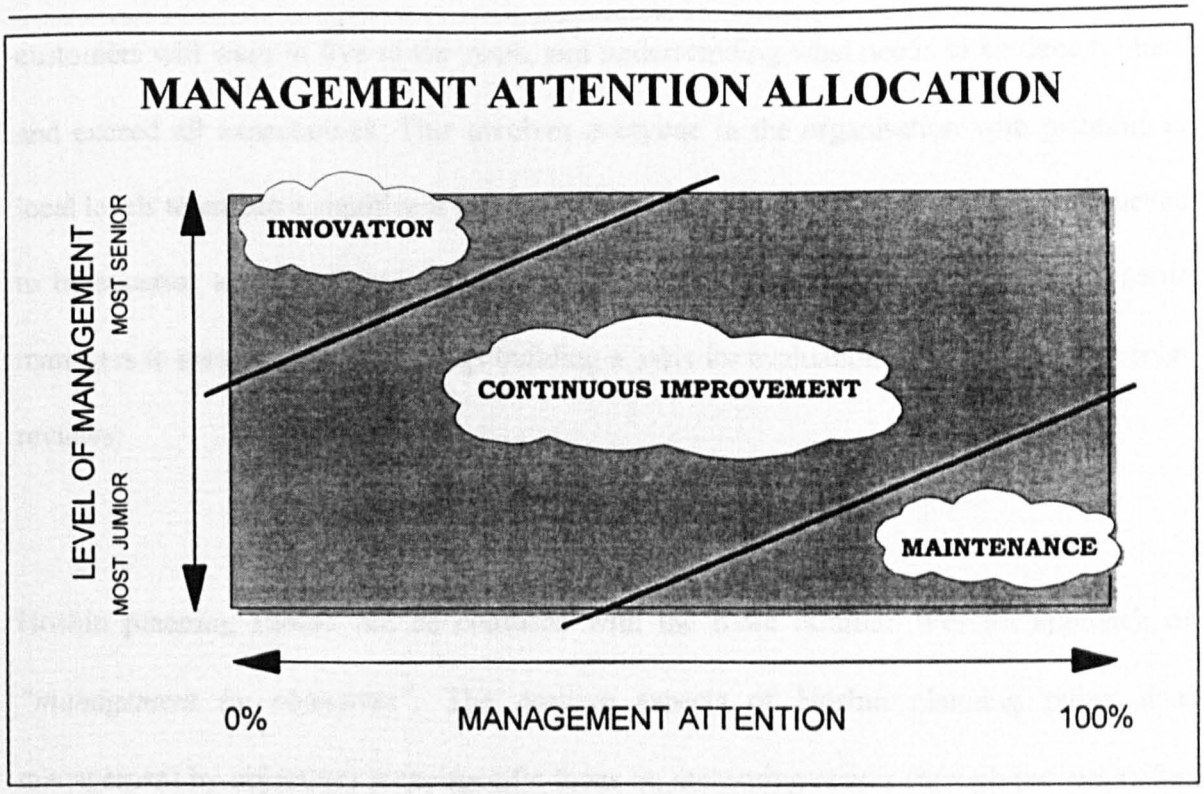


Figure 8:- Management Attention Allocation

Source - Kaizen: The Key To Japan's Competitive Success {39}

4.7 Policy Deployment

Policy deployment is a management technique originated in Japan from the term *"Hoshin Kanri"* or *"Hoshin Planning"* {40} . It is also common to see alternative definitions such as policy management, policy control or management by policy. Hoshin Kanri represents a core aspect of Japanese companies management systems. Professor Akao describes Hoshin Planning as: *"The means by which both the overall control system and TQM are deployed"* {40, 41}. A literal translation that would make sense to most people is *"target and means management"*. This implies a significant focus on the means or process by which targets are reached. Hoshin planning principles are formulated around companies knowing what their

customers will want in five to ten years, and understanding what needs to be done to meet and exceed all expectations. This involves everyone in the organisation with planning at local levels to ensure a significant buy-in to the overall process. Hoshin planning is believed to be superior to other forms planning due to its bottom-up nature and ability to enable managers to measure the right things building a basis for evaluation as well as quick regular reviews.

Hoshin planning should not be confused with the more familiar Western approach of *"management by objectives"*. The positive aspects of Hoshin planning rather than management by objectives is the specific focus on measuring results through process rather than targets. In management by objectives the objectives of the target setting and measurement, tends to be on business tangibles such as profits and cost. Hoshin planning tends to focus on self assessment with individual participation and flexibility.

In order to apply the principles of Hoshin planning effectively, there are a number of prerequisites that an organisation have in place. It is not sufficient to attempt to translate to an environment of Hoshin planning as a short term solution. Instead the organisation must develop a strategy based on the five phases as suggested in Figure 9. These phases can be approximated to Maslow's {42} concept of a hierarchy of needs, where individuals must have their basic needs met before they can move onto higher needs.

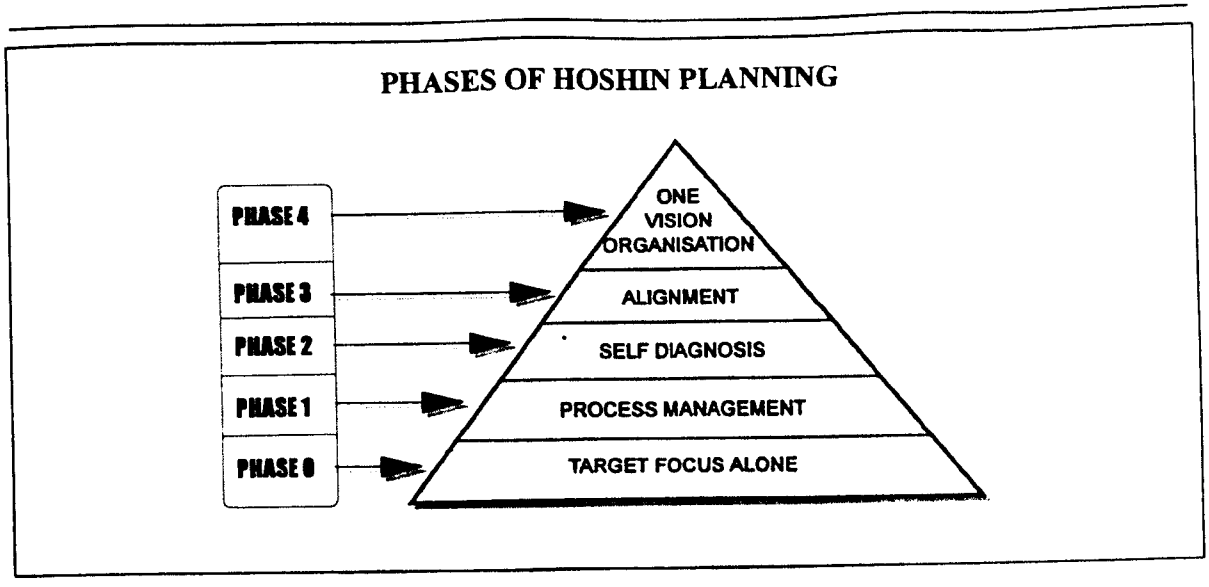


Figure 9:- Phases Of Hoshin Planning

Source - Hoshin Kanri {40}

In traditional, authoritarian strategic planning models, there is usually no two-way communication between different management levels. Hoshin Kanri challenges conventional thinking by introducing *"catchball"* as a critical process. Catchball is the term used to describe the horizontal alignment of goals and plans and the vertical flow of information up and down the organisation.

4.8 New Product Introduction

Typically, in the UK only 23% of products are delivered on time, due to lack of effective communication between departments and overcoming entrenched values, which represent 41% of the barriers to successful product development experienced {43}. Top management's leverage to influence a project is greatest at its beginning, stemming from the product design decisions that have not been made yet. Unfortunately, the typical pattern of

top management involvement parallels the project's spending curve, which is essentially the inverse of management's leverage curve. as shown in Figure 10 {44}.

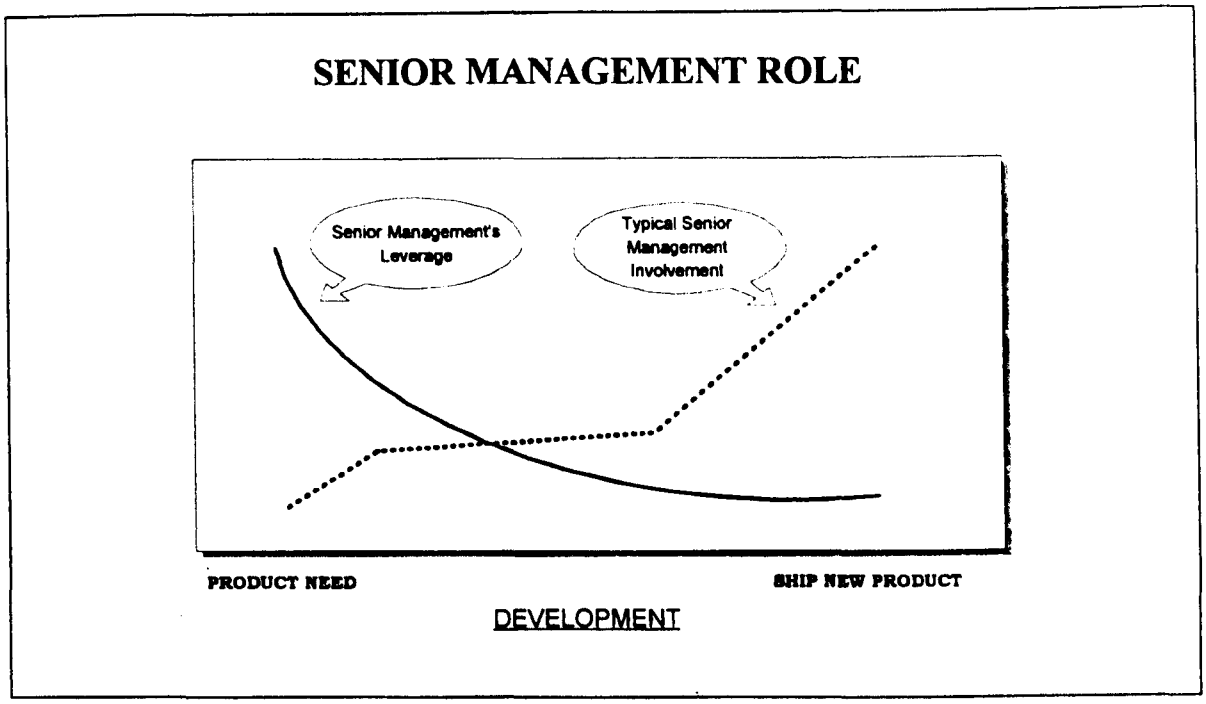


Figure 10:- Senior Management Role

Source - Developing Products In Half The Time {44}

Simultaneous Engineering (SE) became very much in vogue during the late 1980's as the panacea for Western company's product development inefficiencies {45}. The SE approach encourages downstream activities to be pulled forward as long lead activities within the project plan. This encourages overlapping of both upstream and downstream activities, and an engineering change profile as shown in Figure 11 {46}.

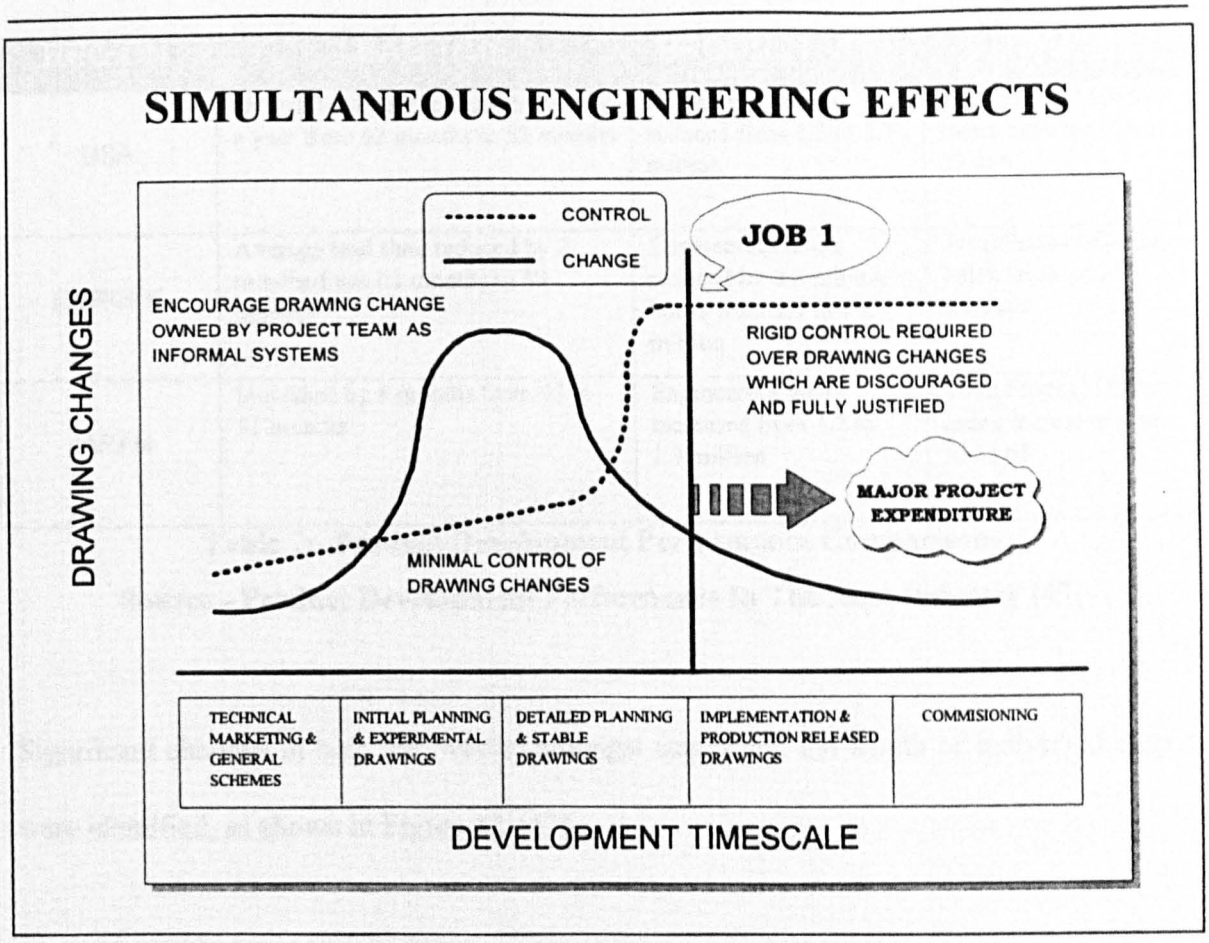


Figure 11:- Simultaneous Engineering Effects

Source - Simultaneous Engineering {46}

The IMVP research programme of product development performance in the 1990's investigated the automotive industry's response to increasing market pressures, specifically seeking evidence of significant changes in the way new product development is organised and managed {47}. The research concluded that striking changes were emerging in new product development performance from the 1980's to the 1990's, that differed by region, as shown in Table 7. The research concluded that a major driver of the improvements appeared to be overlap in problem solving cycles.

REGION	LEAD TIME	PRODUCTIVITY	QUALITY
USA	Overall lead time reduced by nearly a year from 62 months to 52 months	Engineering hours reduced from 3.5 to 2.3 million	Total Product Quality index increased from 35 to 45
EUROPE	Average lead time reduced by 2 months from 61 months to 59 months	Engineering hours reduced by 0.2 million hours from 3.4 to 3.2 million	Total Product Quality index remained constant
JAPAN	Increased by 8 months from 43 to 51 months	Engineering hours increased from 1.2 to 1.3 million	Total Product Quality index increased from 53 to 61

Table 7:- Product Development Performance Comparisons

Source - Product Development Performance In The Auto Industry {47}

Significant changes in both the overlap amongst stages and the length of individual stages were identified, as shown in Figure 12 {47}.

In Japan, the increase in overall engineering hours is the result of less overlap, despite a decrease in individual stage lengths. In contrast, because of greater overlap, the total duration of product and process engineering lead timed remains constant in the US, despite an increase in individual stage lengths. The US projects reflect the use of simultaneous engineering principals, with much earlier involvement from process engineers. In Europe, projects show an increase in engineering hours, where increased overlap is insufficient to outweigh an increase in the individual stages.

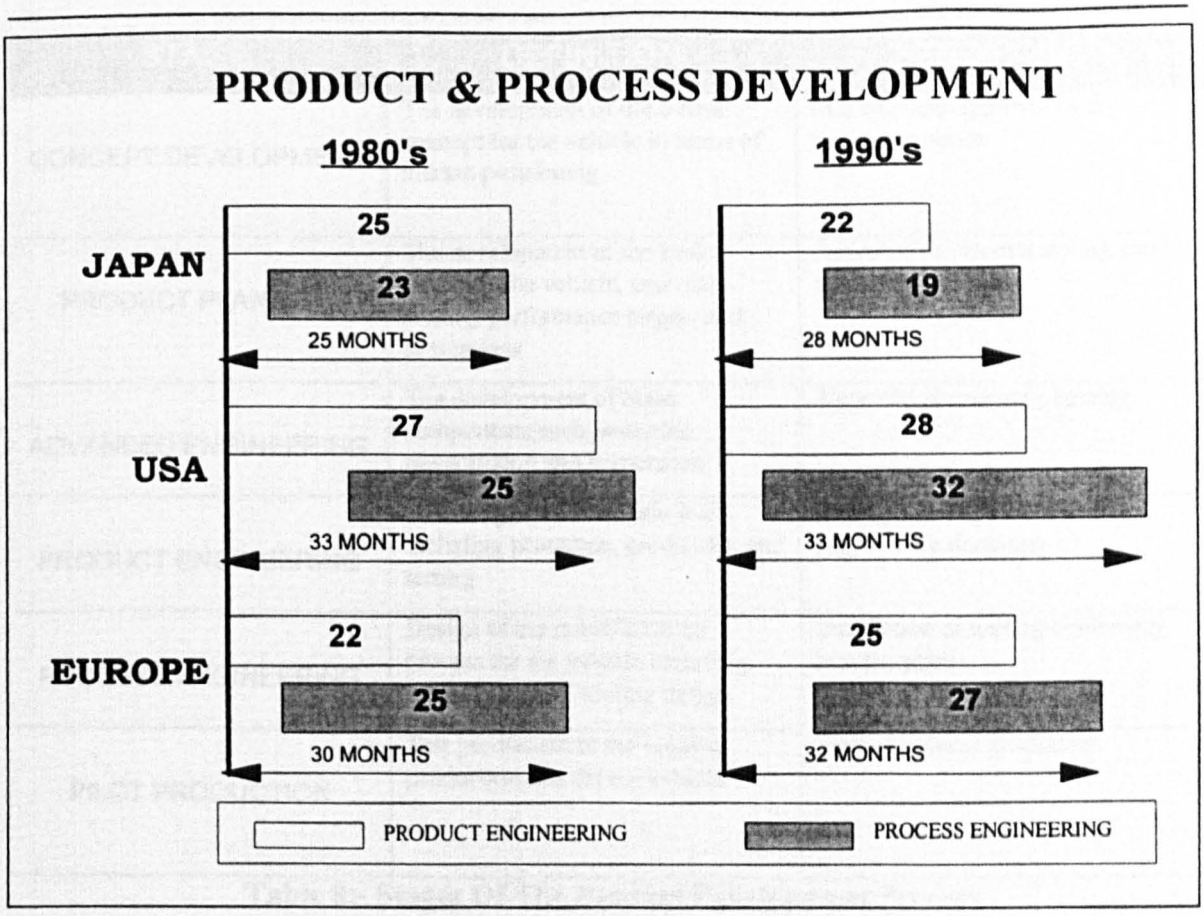


Figure 12:- Product & Process Development

Source - Product Development Performance In The Auto Industry {47}

The individual stages of the product development process as concluded from this research are shown in Table 8. This reflects the simultaneous engineering methodology and its requirement to increase the overlap phase of interface stages, such as product/process engineering, and planning/engineering lead time. The stage of advanced engineering is sometimes referred to as shelf engineering, blueprint designs or pre-development component engineering activity. Carried out effectively it can overlap with the concept development and product planning stages, by integrating the major technical assumptions and component package space requirements.

STAGE	DEFINITION	END POINT
CONCEPT DEVELOPMENT	The development of the overall concept for the vehicle in terms of market positioning	Management approval of the concept proposal
PRODUCT PLANNING	The development of the basic layout of the vehicle, external styling, performance targets and cost targets	Approval of external styling and other critical targets
ADVANCED ENGINEERING	The development of main components such as engine, transmission and suspension	Approval of product planning
PRODUCT ENGINEERING	The design of the vehicle itself, including prototype, production and testing	Management approval of engineering drawings
PROCESS ENGINEERING	Design of the manufacturing process for the vehicle including plant layout and tooling design	Installation of tooling equipment into the plant
PILOT PRODUCTION	Test production at the volume production line for the vehicle	Start of volume production

Table 8:- Stages Of The Product Development Process

Source - Product Development Performance In The Auto Industry {47}

The research of new product introduction is presented in Project Report Three.

4.9 Examples Of New Product Introduction Processes

A comparison of new product introduction processes at a variety of companies (including non-automotive), was carried out at various to establish different methodologies for defining and documenting the process. The trend is for companies (both automotive and non-automotive) to define their process as a multitude of stages (in more detail than the generic

phases of concept study, product planning, product and process engineering). Table 9 shows a summary of the process titles and number of defined stages.

COMPANY	PROCESS TITLE	STAGES
BMW	Gateways In New Product Development	7
CHRYSLER	New Product Development Strategy	4
FORD	World Class Timing Milestones	11
HONDA	Programme Milestone Philosophy	8
IBM	Manufacturing Engineering Initiative	5
LUCAS	Product Introduction Management	5
MOTOROLA	New Product Launch Guidelines	44
RENAULT	Project Management System	6
TOYOTA	Generic Development Process	9
XEROX	Product Delivery Process	3
ROVER	Project Management Guidelines	8

Table 9:- New Product Introduction Process Stages

Source - References Contained In Bibliography {1-11}

The new product development process definition is generally captured as either a brochure, booklet or procedure document. In some cases the document is of a philosophical and generic nature, whereas in others it consists of detailed check-lists of activities and measures. A problem with this type of process definition and documentation is that it is usually generated by central staff functions (sometimes as an academic exercise) who are not directly involved in the process of new product development. As such it can simply become perceived as another management procedure, ignored by project managers and engineers and soon becomes outdated as new practices emerge. No evidence was found of a

"learning culture" which embraced new practices in real time and encouraged new product project teams to become actively involved in process creation and improvement.

The research of companies new product introduction processes is presented in Project Report Three.

4.10 Quality & Reliability Tools And Techniques

A variety of basic quality and reliability tools and techniques exist; such as Shewhart's *"Plan-Do-Study-Act"* cycle {48}, the seven basic quality control tools {49}, and the seven management planning tools {50}. These tools tend to be applied during an initial TQM programme, and form the basis of the training. More advanced tools and techniques are available for application within the new product introduction process.

Feigenbaum describes the concept of new design control defined as *"the establishment and specification of the necessary cost-quality, performance-quality, safety-quality and reliability-quality for the product required for the intended customer satisfaction, including the elimination or location of possible sources of quality troubles before the start of production"* {51}. A model for new design control is shown in Figure 13. O'Connor {52} applies the British Standard (BS 4778) definition of reliability as *"the ability of an item to perform a required function under stated conditions for a stated period of time"*. He states

that *"the reliability of a product is strongly influenced by decisions made during the design process"*, and recommends the application of fifteen specific tools. This is fundamental, as the cost of problem resolution increases ten fold, with each stage of the new product introduction process.

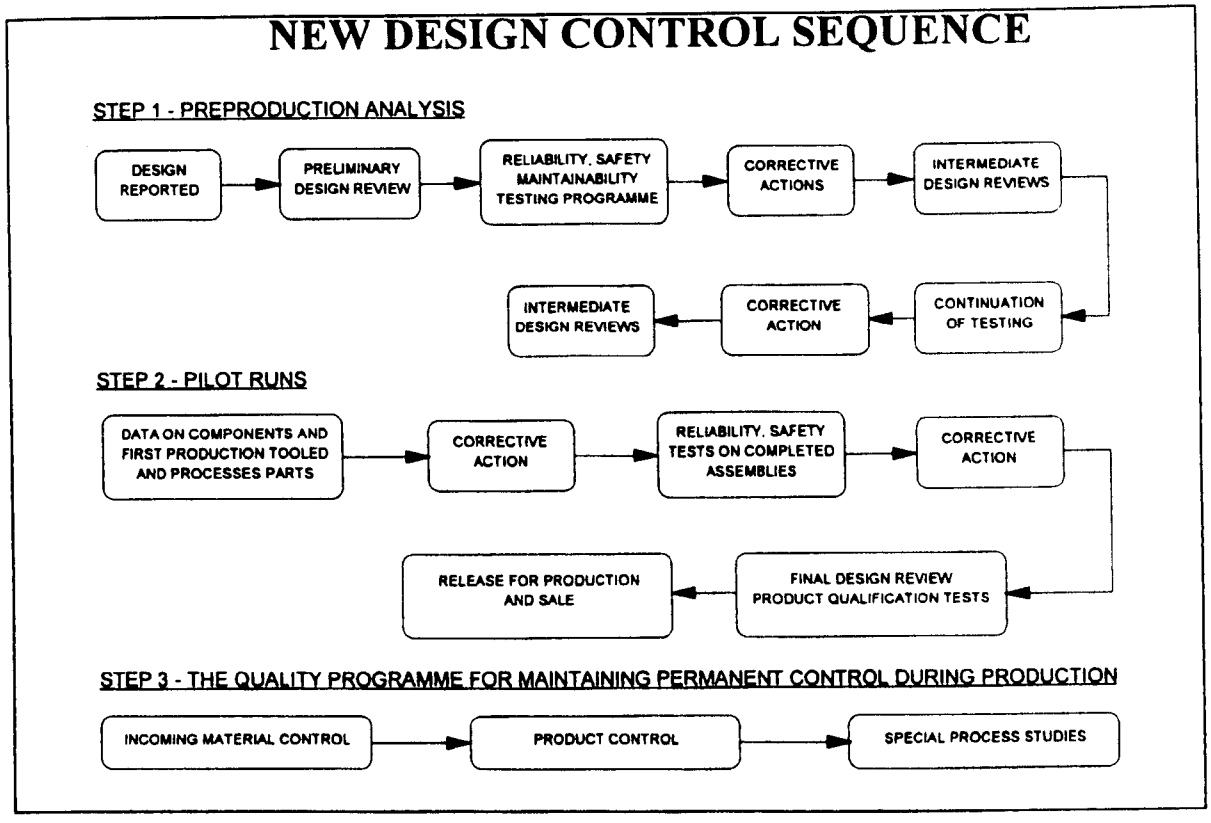


Figure 13:- New Design Control Sequence

Source - Total Quality Control {51}

Therefore, the design process must be organised to ensure that failure-free design principles are used, and that any deviations from these principles are detected early enough to take the necessary corrective actions. To achieve failure-free design, O'Connor recommends the application of fifteen tools. The purpose of applying quality and reliability tools during the new product introduction process is to achieve preventive quality assurance. To be

preventive, the tools must be applied at the relevant stage of new product introduction, to capitalise on the strength of influence that exists at the front end stage of new product introduction that is estimated at 40% {53}. This approach assumes that prior to commencing quality planning activities, the scope and level of detail is understood relative to the risks involved, according to the nature of the product programme. The risk can be approximated as a relationship between quality improvement influence and cost of problem resolution, as shown in Figure 14 {54}.

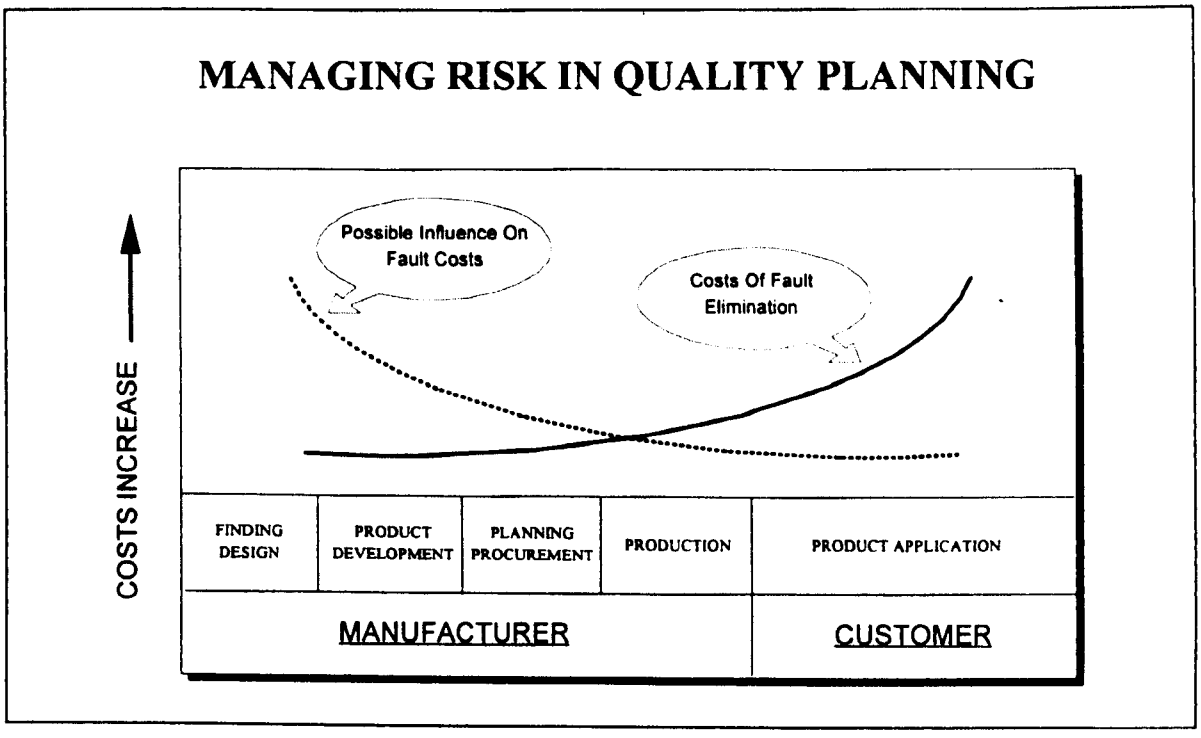


Figure 14:- Managing Risk In Quality Planning
Source - Guideline To The Methods Of Quality Management {54}

However, in terms of industrial application of quality and reliability tools and techniques, there is a considerable gap between those on offer and those used {55}. Research into the application of the FMECA technique in the UK demonstrated that whilst companies found

the technique to be useful, the actual reasons for applying the technique were predominantly due to a customer contractual requirement. Difficulties associated with technique application concluded that 46% were *"related to management issues, such as commitment, training and resource allocation, rather than fundamental understanding of the basics of cause and effect analysis. Formal training was provided to employees in only 58% of the companies surveyed"* {56}.

The research led to the conclusion that to successfully apply quality and reliability tools within the new product introduction process, it is necessary to consider the predominant and sub-culture norms that exist within the new product introduction organisation. The implementation strategy must be designed appropriately to ensure congruence amongst the organisational attributes such as strategy, structure and culture. That is, to identify the organisational attributes and activities relevant to the company, and achieve an element of mutual alignment. Beyond this alignment, the implementation efforts should be directed towards achieving synergy among the relevant organisational attributes and activities.

A review of the research into quality and reliability techniques is presented in Project Report Four.

PROJECT IMPLEMENTATION

5. PROJECT IMPLEMENTATION

5.1 Rover Group Quality Strategy Development

The Rover Group Quality Strategy is based on the identification of eighty-nine milestones for each of the companies nine key business processes. The milestone definition was *"an action or event whose occurrence can be objectively verified and which will materially contribute to the improvement of the process"*. The author combined aspects of Group Judgement techniques such as *"Delphi"* and *"Social Judgement"* to create the milestone development process {57, 58}.

Social Judgement assumes that individuals will draw conclusions about unknown quantities on the basis of available information, but will disagree due to differential importance assigned to the information presented. The Delphi technique is a method for structuring a group communication process, to allow a group of individuals as a whole deal with a complex problem. The Delphi technique was originally developed by a US defence research project in the 1950's, and has since been applied in the Far East and Europe, primarily to develop long range technological forecasts. The technique aims at developing consensus by avoiding dominance by quantity or strength of personality, through questionnaire surveys analysed by a monitoring team. However, employing statistised groups which do not meet during a Delphi survey, can lead to aggregated judgement which does not adequately take account of the best available judgement, from the most competent respondent.

The Delphi technique was adapted by the author by inclusion of group discussions, to create the quality strategy development process as shown in Figure 15. The implementation of this process was led by the author, to achieve consensus of judgement from a population of seven hundred managers across the nine key business processes.

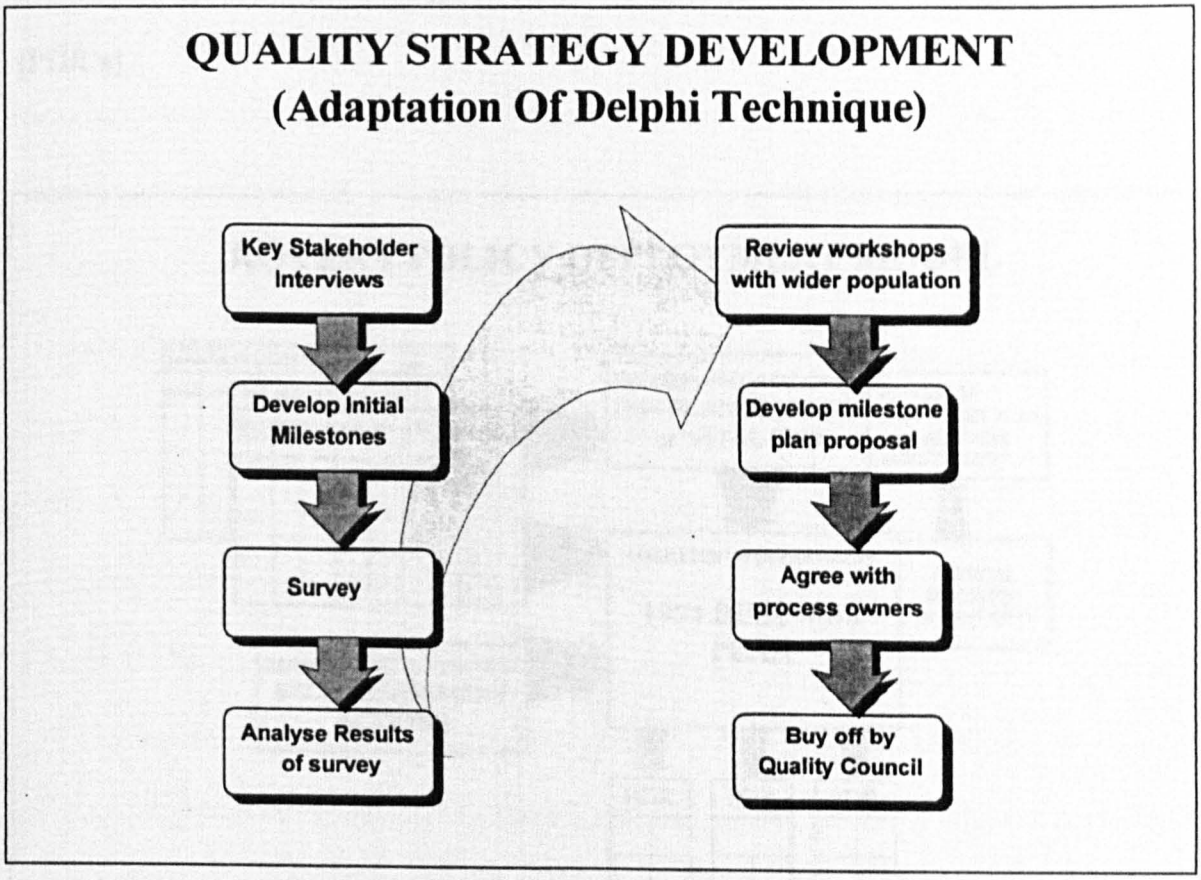


Figure 15:- Quality Strategy Development

The Rover Group Quality Strategy which was developed from application of this methodology is shown in Appendix 3.

5.2 Rover's Policy Deployment Model

The author led the implementation of the Rover Group Quality Strategy throughout the business using Hoshin Planning principles. Figure 16 shows a schematic view of the policy deployment model used to deploy the quality strategy milestones, into operation and department business plans through to individual employee Personal Development Reviews (PDR's).

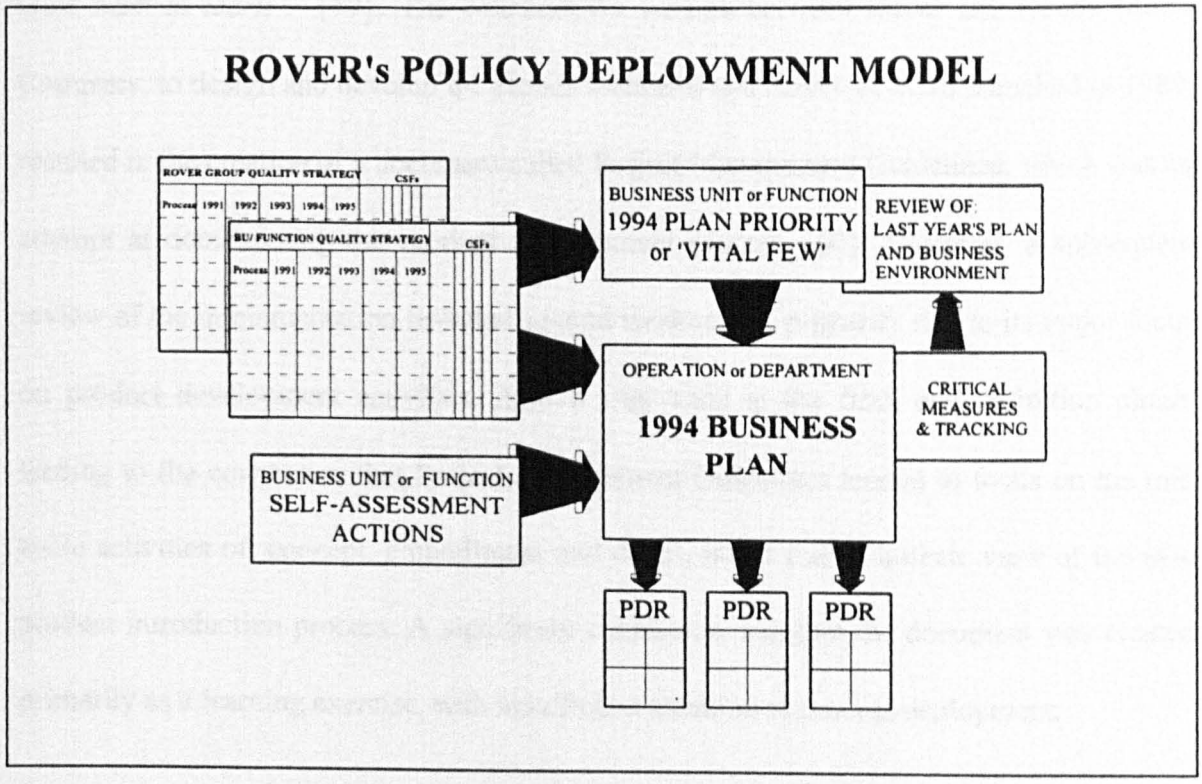


Figure 16:- Rover's Policy Deployment Model

Examples of Quality Strategy deployment are shown in Appendix 4. The application of Hoshin Kanri policy deployment of the Rover Group Quality Strategy was monitored on a

regular frequency by self assessment, to measure progress against the milestones and to refine the quality strategy on an annual basis. An example is shown in Appendix 5.

5.3 Project Management Policy

Whether collaboration leads to competitive surrender or revitalisation depends foremost on what employees believe the purpose of the alliance to be. It is self evident *"to learn, one must want to learn"* {59}. The collaborative venture between Rover and Honda Motor Company, to design and develop the Honda Concerto and Rover 214/216 launched in 1989, resulted in the creation of a document called Project Management Guidelines, which was an attempt at documenting the product development process {60}. However, a subsequent review of the implementation revealed several weaknesses, primarily due to its major focus on product development activities. Also it was weak at the front end definition phase, leading to the conclusion that Project Management Guidelines tended to focus on the mid cycle activities of; concept, embodiment and detail, rather than a holistic view of the new product introduction process. A significant conclusion was that the document was created primarily as a learning exercise, with insufficient attention to process deployment.

The author led a process re-engineering project that resulted in the creation of *"Project Management Policy - PMP"* that represents a comprehensive documentation of Rover's new product introduction process. The PMP process overview is shown in Figure 17. The

adapted Delphi Technique (as applied during the quality strategy milestone process) was applied, to create checklist activities and success criteria for each of the phases within the route map.

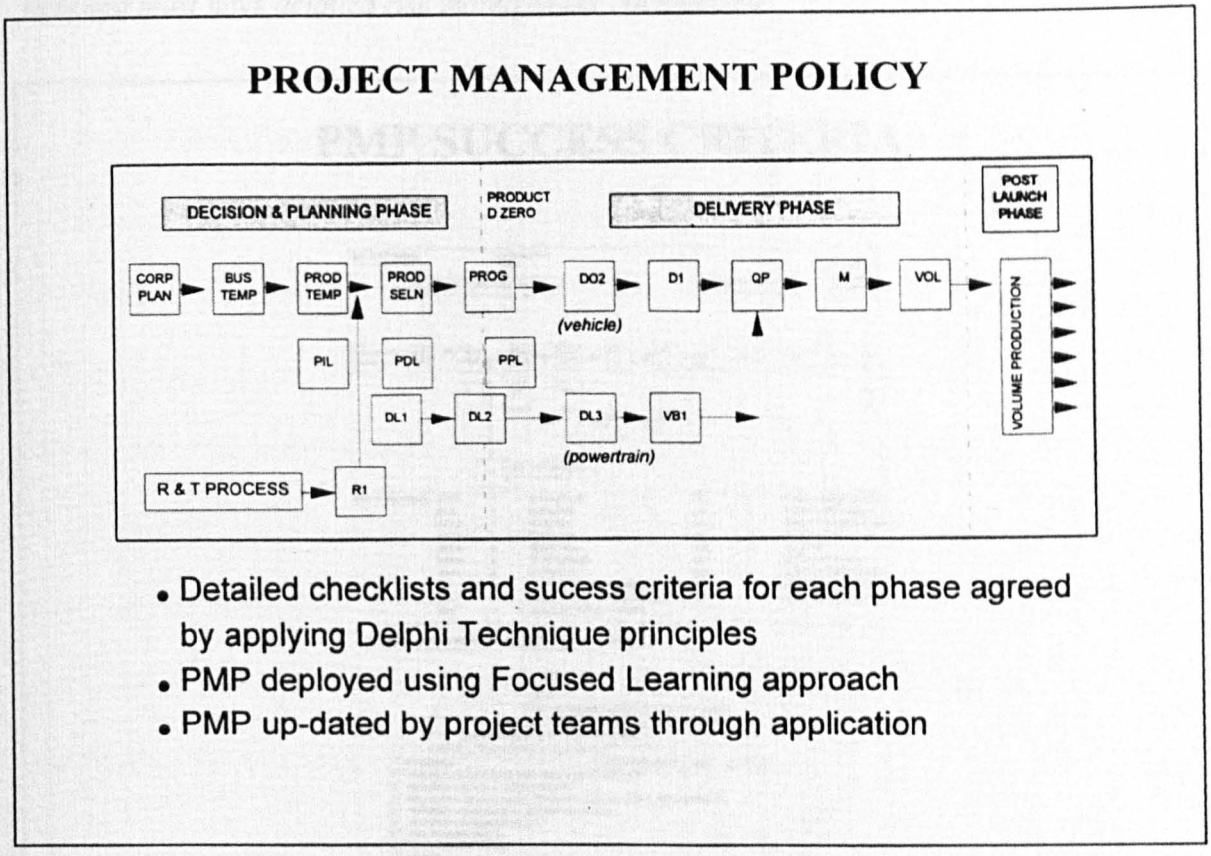


Figure 17:- Project Management Policy

The intention was to establish the key measures at each stage of the new product introduction process to foster a focus on quality and overlapping iterative phase methodology. The key measures could also be applied to obtain senior management involvement in major programme review stages, where critical decisions are often taken.

The PMP success criteria are shown in Figure 18, with an example in Appendix 6. The quality strategy established PMP as company policy by inclusion of a milestone for the new product introduction process, as : *"conformance to the Project Management Policy by tailoring the information to the needs of the project. Best practice guidelines that are not followed must have detailed risk management documented"*.

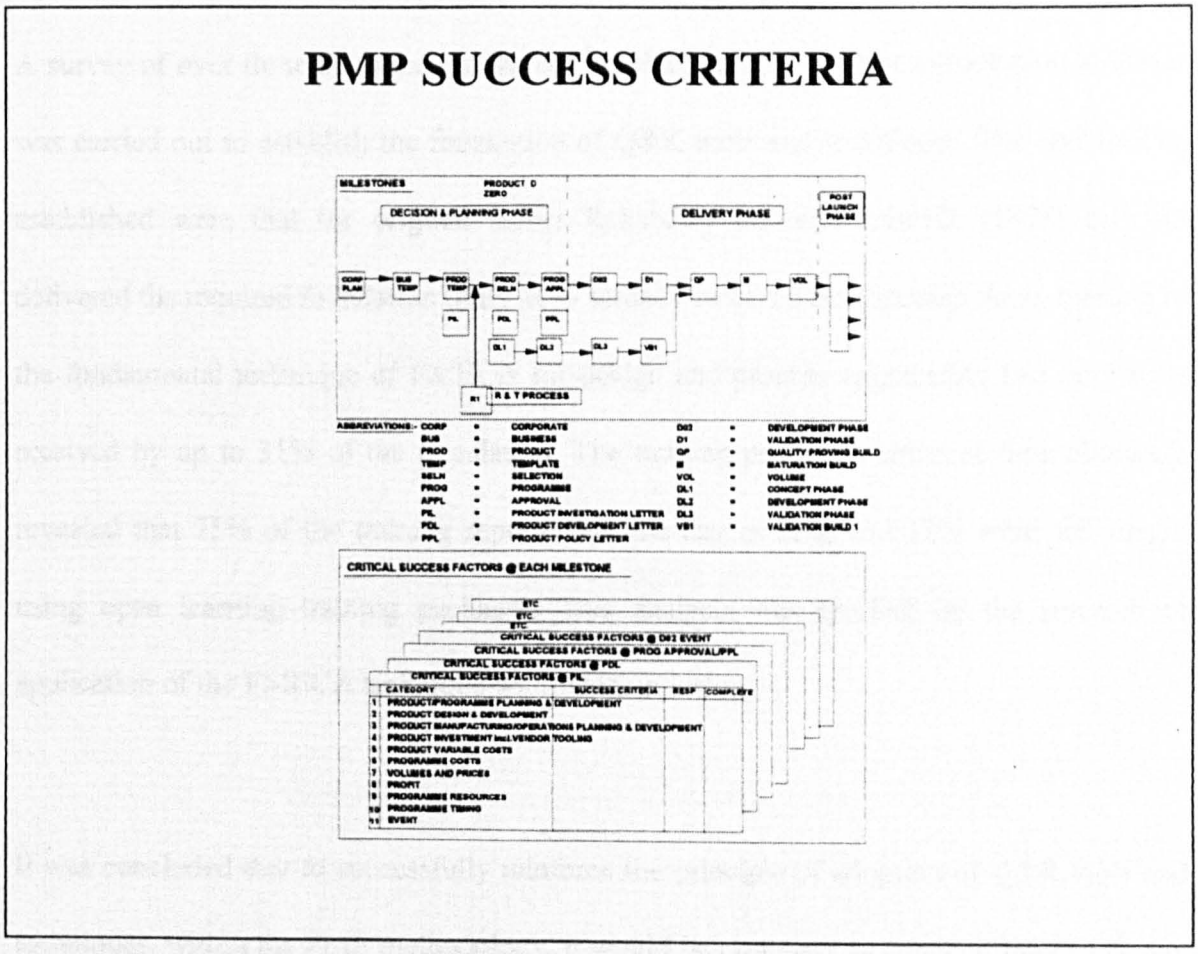


Figure 18:- PMP Success Criteria

PMP is included as a separate submission within the portfolio {61}. Further details of the PMP development process are presented in Project Report Three.

5.4 Common Business Environment

The PMP methodology for new product introduction included the principle of application of quality and reliability tools within each of the major programme phases. These were established and incorporated following the research into Q&R tools and techniques.

A survey of over three thousand employees involved in new product introduction at Rover was carried out to establish the foundation of Q&R tools and techniques. The conclusions established were that the original Rover Reliability Initiative cascade (1991) had not delivered the required foundation (only 46% actually received the cascade). Also, training in the fundamental technique of FMECA for design and process engineering had only been received by up to 31% of the population. The training profile in terms of time allocated, revealed that 75% of the training represented one day or less, and 12% were self taught using open learning training packages. This analysis was typified by the research of application of the FMECA technique within UK industry.

It was concluded that to successfully reinforce the principle of adoption of Q&R tools and techniques, within the PMP methodology, it would be necessary to create a framework that would establish preferred tools and techniques, common vocabulary, and measures.

The framework selected for Common Business Environment is shown in Figure 19.

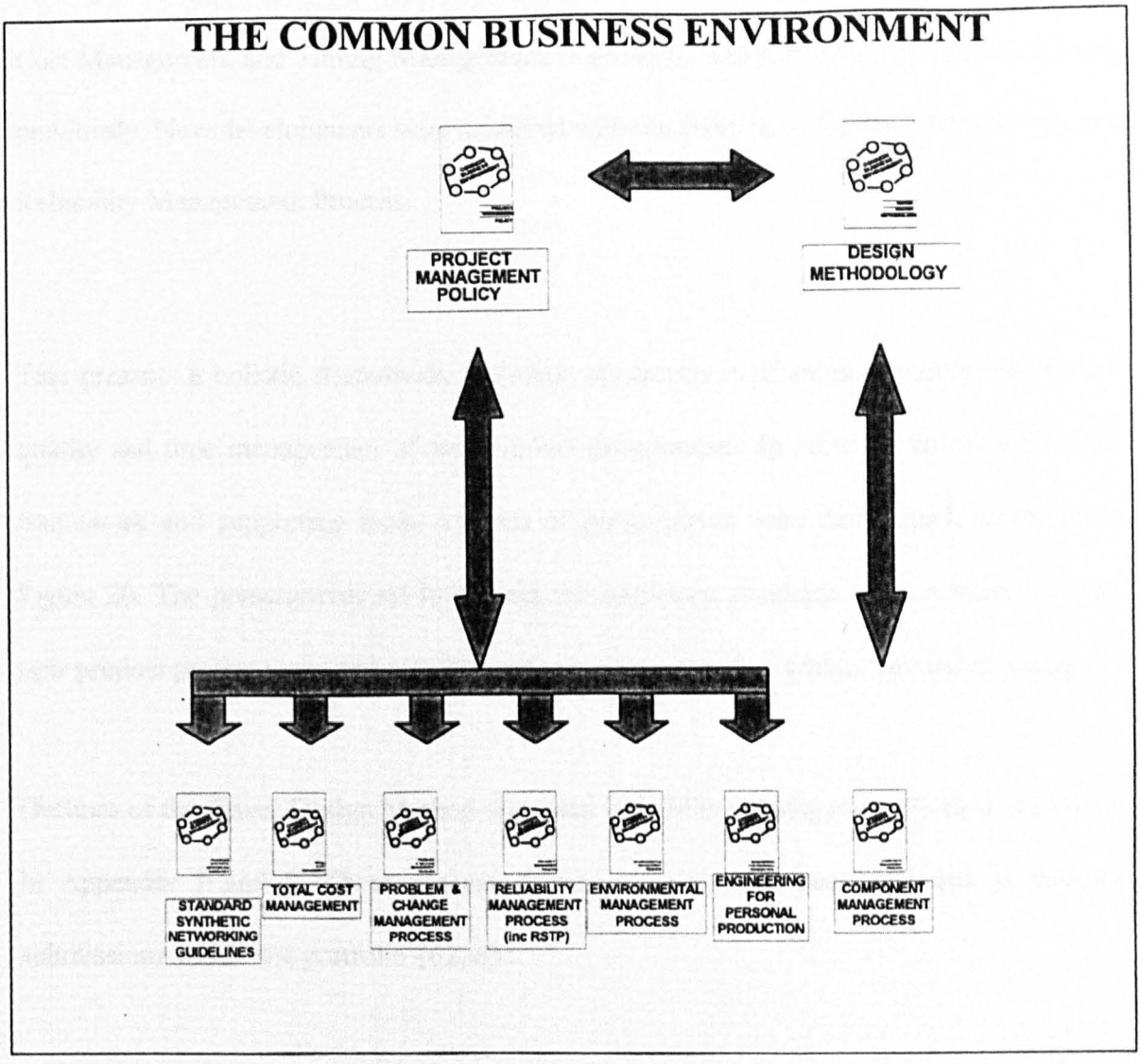


Figure 19:- The Common Business Environment

This demonstrates a top down methodology, which positions PMP and Design Methodology at the top of the hierarchy. These are the principal project management tools for delivering products through the new product introduction process at Rover. The supporting processes are set beneath as a series of tool kits for new product teams, incorporating activity guidelines, and tools and techniques.

The supporting processes were a combination of current company processes, such as Total Cost Management and Timing Management Guidelines, which had already been developed previously. New developments were achieved with the creation of Design Methodology and Reliability Management Process.

This presents a holistic framework, including apparently conflicting requirements of cost, quality and time management of new product programmes. In order to reinforce the CBE framework and supporting tools, a series of prescriptives were determined, as shown in Figure 20. The prescriptives set in context the minimum standards to be achieved by any new product project team, and are declared management policy within the quality strategy.

Outlines of the Rover Design Methodology and Reliability Management Process are shown in Appendix 7 and 8. These process documents have also been included as separate submissions within the portfolio {62, 63}.

The Common Business Environment is discussed further in Project Report Four.

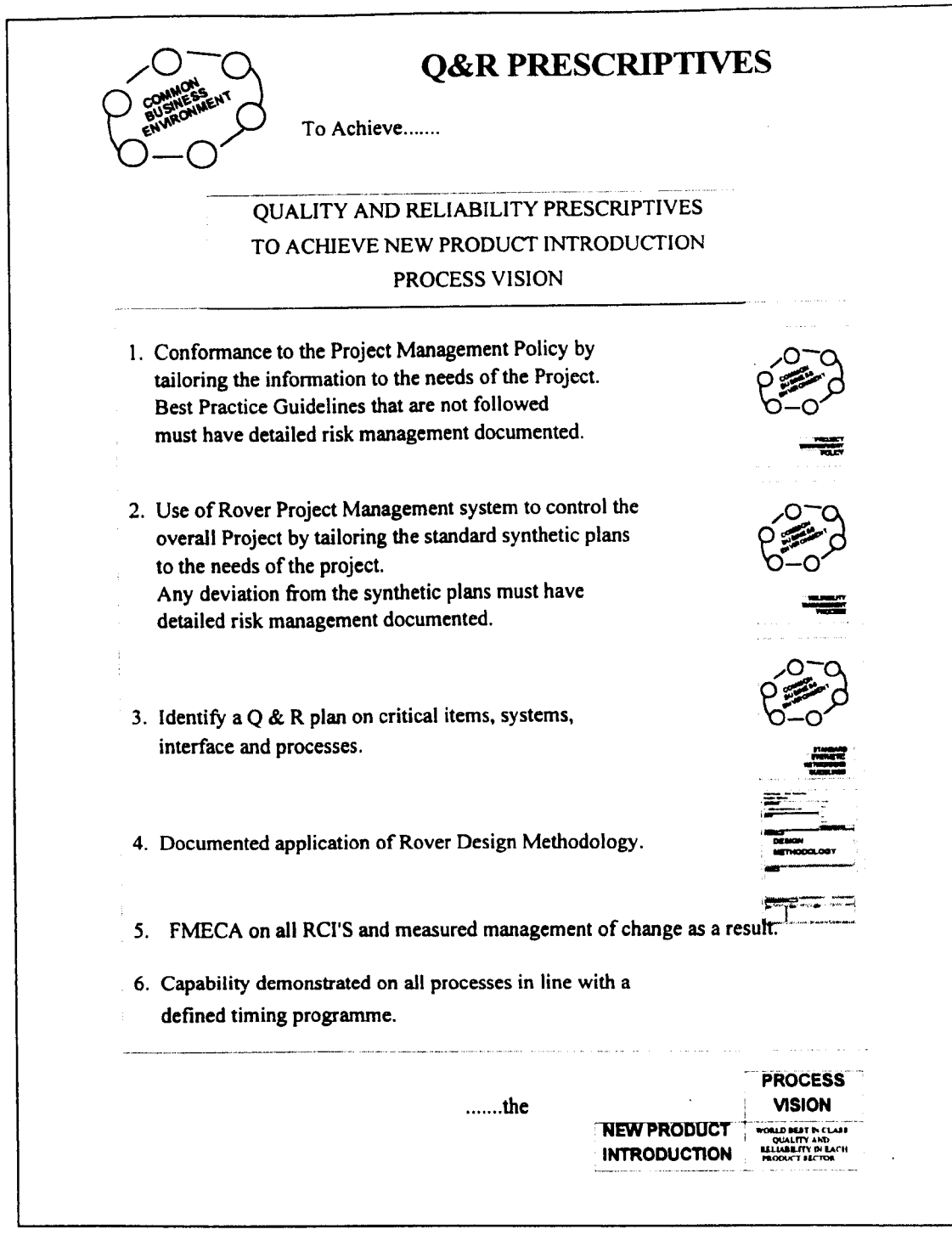


Figure 20:- The Six Q&R Prescriptives

5.5 Self-Assessment Process

As a methodology for assessing conformance to the six Q&R prescriptives, the author developed a project team self-assessment process, which was based on the principles of the EFQM model, as shown in Appendix 9.

A monthly schedule of senior management reviews was arranged for each of the new product programmes, with the specific objective of providing a focal point review to confirm the project team self-assessment conclusions. This approach ensured visible senior management commitment to the prescriptives, and led to the notion of *"walking the project"* to assess results and individual motivation, and the recommendation of improvements to PMP.

The project CB40 (Freelander) recommended improvements to the phasing of certain activities within PMP, to obtain a more logical flow, and recognising that an opportunity existed for gaining further support from other areas outside the project team. Also, that the Rover Project Management System (RPM) required expansion to encapsulate all PMP activities. The application of the Reliability Management and Control Document was stated to have a high level of ownership across the team, following a comprehensive project team workshop to develop the plan. The FMECA application was declared to be in place for all reliability critical items and processes, following the focused learning training, but that an improvement could be obtained in the management of measured corrective actions. The

design methodology application was emphasised within the design process known as Concurrent Assemble Mock Up (CAMU), but that there were areas of insufficient application. The process capability plans were in place, but a full demonstration would not be available until the Quality Proving (QP) phase of PMP.

5.6 Focused Learning

The Common Business Environment framework of PMP, Design Methodology and Reliability Management Process was deployed into new project teams by application of a training methodology known as Focused Learning. This represents a training process, which is dependent on expert facilitation and learning by doing in the workplace rather than in a classroom environment. Key elements include definition of current status, training needs analysis, determine training plan, train the trainers, implement the training and measure success.

The author led a team of experts from the Project Management Process Group, to create Focused Learning material, and provide a facilitation service to each of the project teams in the implementation of PMP and the support processes. Common Business Environment process manuals were only issued to those employees who attended Focused Learning events, and in this way the issue control of the document was carefully monitored and controlled. The focused learning approach is shown in Appendix 10.

The Focused Learning approach is discussed further in Project Report Four, and an application for a National Training Award has been included as a separate portfolio submission {64}.

5.7 Project Team Organisation

Experience at Rover has concluded that the project team organisation alone will not deliver the trilogy of lead time, cost and quality performance metrics. The requirement for a robust and rigorous process definition has been demonstrated, with the case study of project P38A (Range Rover) which did not apply PMP. The results are discussed in Project Report Six, and conclude that whilst the investment and component piece price were delivered, this was at the expense of lead time and initial launch quality.

It is proposed that the effective delivery of new product, requires both a sound new product introduction process and an appropriate team based organisation. Different organisational approaches have been studied and applied at Rover, with varying degrees of success. As a result, the engineering community at Rover has progressively transformed from a traditional matrix management structure, to project teams and finally a team based structure based on a Project Nucleus and Areas of Specialism. Figure 21 shows the organisation structure for new product introduction teams at Rover Group. The project leader is represented at the centre of the project nucleus, surrounded by Areas of Specialism (AOS), of which ten represent component and system engineering delivery and twelve are support roles. The

project leader has overall responsibility for the vehicle programme, including deployment of the project to the requirements of PMP The AOS's are responsible for seconding full time skilled specialists to the project team, which for the engineering specialists generally represents the life of the programme. The support roles tend to be on a part-time basis only. This team based organisation can be compared with the Heavyweight Project Leader philosophy, where the project leader *"Shusa"* has overall responsibility for the vehicle programme {44}.

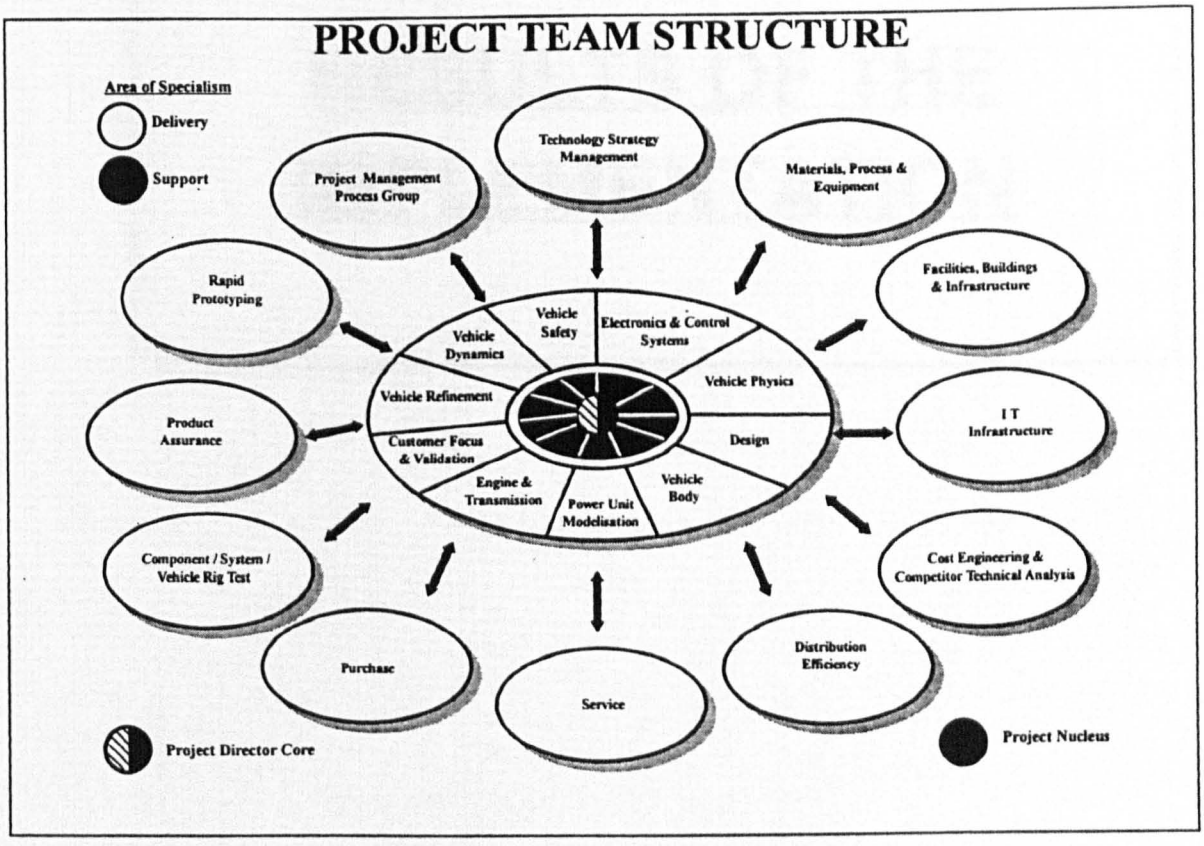


Figure 21:- Project Team Structure

A review of new product introduction team approaches is presented in Project Report Five.

RESULTS OF THE IMPLEMENTATION

6. RESULTS OF THE IMPLEMENTATION

6.1 Quality Strategy

The Rover Group Quality Strategy is now firmly established as the major management planning and business performance measurement system. The quality strategy (1991 to 1995) was deployed using Hoshin Kanri principles across the business, subjected to regular reviews and re-issued annually through four cycles. The Chief Executive of Rover Group presented the Engineering Manufacturing Forum Lecture, at Warwick University on 17th May 1994, "The Emergence of Rover" and quoted *"we've identified our core processes, we've identified our strategy, we've adopted a total quality programme, we've aligned our workforce in a spirit of contribution, we've got our suppliers thinking the same way .....the words 'extraordinary customer satisfaction' are the three most important words in the company"*. The quality strategy has been up-dated to reflect improvement milestones for the period 1996 to 2000. Therefore, quality is firmly embedded within Rover as a key business driver and business measurement system. The quality strategy deployment model is presented in Project Report Two.

6.2 New Product Introduction Lead Time

A review of Rover's new product implementation over the period 1994 to 1997 reveals that out of nine significant vehicle programmes, PMP was applied completely on six, as shown in Table 10.

PRODUCT PROGRAMME	LAUNCH	TIME	PMP	COMMENTS
DISCOVERY 95MY (ROMULUS)	1994	32	NO	Model year up-date
RANGE ROVER 95MY (REMUS)	1994	32	NO	Model year up-date
NEW RANGE ROVER (P38A)	1994	65	NO	Rover programme
MGF SPORTS CAR (PR3)	1995	47	YES	Collaborative with MVS
ROVER 200 (R3)	1995	34	YES	Rover programme
ROVER 600 (SK1)	1995	20	YES	Collaborative with Honda
ROVER 400 (HHR)	1995	28	YES	Collaborative with Honda
ROVER 800 96MY (EXCALIBAR)	1996	12	YES	Model year up-date
FREELANDER (CB40)	1997	48	YES	Rover programme

Table 10:- PMP Implementation On New Products

The vehicle programmes shown represent a combination of model year up-dates, Honda collaborative and stand alone Rover programmes. A comparison of the model year up-date programmes shows that the Rover 800 96MY was delivered in 34% of the time taken for the Land Rover Discovery and Range Rover 96MY programmes. The Rover 400 and 600 were collaborative programmes with Honda, with the concept engineering being carried out by Honda, and delivered into production by Rover project teams to PMP. The Rover 200 programme was a stand alone Rover programme, but was based on a modification to the original Rover 200 (R8) platform concept. For comparative purposes the Range Rover (P38A), MGF and Freelander programmes represent whole new vehicles delivered by Rover to PMP. The MGF was a collaboration with Mayflower Vehicle Systems (MVS), who manufacture and deliver completed body shells to Rover. Therefore the Range Rover and

Freelander (both stand alone Rover whole new vehicle programmes delivered at the Land Rover Solihull factory), were selected to provide a comparison of a PMP programme versus a conventional programme. The lead time comparisons can be placed in context with the research presented in Table 7. The lead time for the Freelander programme (PMP deployment) demonstrates levels of performance that are 19% faster than European average, and 6% faster than the Japanese average. The new Range Rover programme lead time was worse than the European and Japanese average by 10% and 27% respectively. Freelander was delivered in a lead time which represented 74% of the time required to develop the Range Rover.

A comparison of the lead times of Range Rover and Freelander with the research presented in Project Report Three is shown in Table 11.

PROGRAMME STAGE	EUROPE	JAPAN	USA	P38A	CB40
PRODUCT ENGINEERING	25	22	28	53	33
PROCESS ENGINEERING	27	19	32	36	32
OVERLAP	20	13	27	32	23
TOTAL	32	28	33	57	42
PLANNING STAGE	22	19	17	21	10
ENGINEERING STAGE	40	34	39	54	43
OVERLAP	6	-1	5	11	5
TOTAL	56	54	51	65	48
TOTAL LEAD TIME	59	51	52	65	48

Table 11:- Lead Time Comparisons

Source - Product Development Performance In The Auto Industry {47}

This shows the lead time in months for the projects studied, the total lead time quoted for Europe, Japan and USA represents an overall average of programmes. The definitions used to develop the lead time comparisons were as follows:-

- *Product Engineering* - The design of the vehicle itself, including prototype production and testing. Stage ends with management approval of drawings. PMP shows this as Product Selection to Validation (D1).
- *Process Engineering* - Design of the manufacturing process for the vehicle including plant layout and tooling design. This stage ends with the installation of tooling equipment in the plant. PMP shows this as Programme Approval (D0) to Quality Proving (QP).
- *Planning* - Time from beginning to end of concept generation and product planning phases of the project. PMP shows this as Product Selection to Programme Approval (D0).
- *Engineering* - Time from beginning of product and process engineering and start of production. PMP shows this as mid point between Product Selection and Programme Approval (D0) to Volume.

The results demonstrate that the Range Rover (P38A) programme, although demonstrating above average levels of overlap between product and process engineering, had excessive individual stage lengths. Also, although the planning lead time was competitive, with high overlap with engineering, the excessive engineering stage lead time compromised the total lead time. Freelander, which applied PMP from initial concept, demonstrates an efficiency improvement over Range Rover for product and process engineering (but was slightly slower than the benchmarks), and a level of overlap which falls in the middle of the benchmarks. The significant gain was achieved in the planning stage which was half that of the benchmarks, whilst maintaining competitive levels of engineering lead time and overlap between the stages.

6.3 Product Quality And Sales Performance

Quality levels for Rover products show interesting trends. The programmes that did not deploy PMP have higher faults per vehicle (FPV) at launch than PMP programmes. The 1996 Model Year Discovery and New Range Rover received disastrous results in the J D Powers Initial Quality Survey (carried out at 90 days service in the USA) with 1.87 and 2.16 FPV in 1996. The UK warranty levels for Range Rover at launch was 8 FPV and £765 per vehicle at twelve months in service. Programmes that deployed PMP such as Rover 200, 400 and 600 have lower warranty levels at approximately 2 FPV and £100 per vehicle at twelve months in service. (Sources: J D Powers survey data 1996 and Rover Group warranty brochure quarter 4 1997).

Warranty trends as a percentage of net sales revenue for Rover products during the period 1990 to 1996 are shown in Figure 22. This demonstrates that product programmes that have applied PMP (Rover 600, New Rover 200 and 400) demonstrate lower warranty levels at initial launch with levels of less than 1% of net sales revenue, compared with non PMP programmes (Discovery , Range Rover) at above 2% of net sales revenue.

Figure 23 shows warranty trends in terms of fault per vehicle (FPV), which confirms the reduced trend in warranty levels at launch. High launch warranty can be disastrous for new products, not only in terms of customer dissatisfaction and image, but also it adversely affects the rate of return on the product investment.

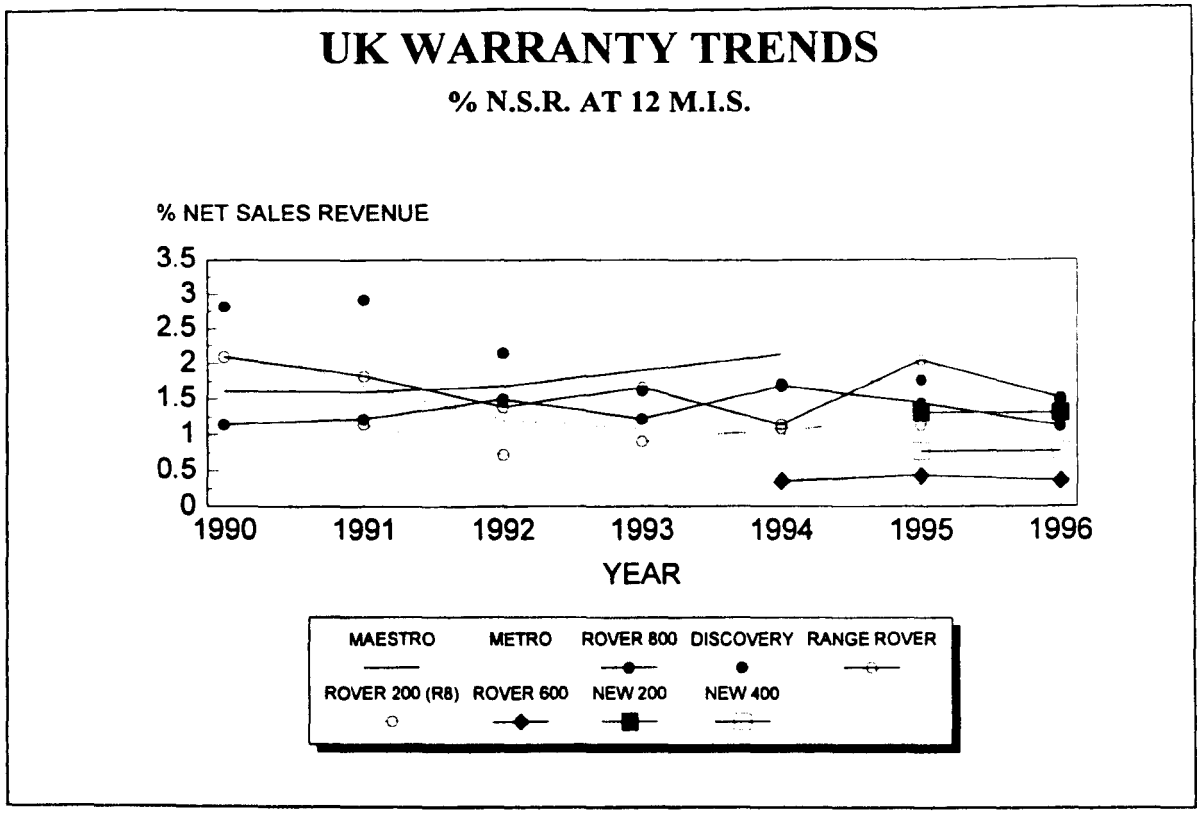


Figure 22:- UK Warranty Trends (% NSR)

Source - Rover Group Warranty Financial Report {84}

In the case of Range Rover the launch warranty level of £765 per vehicle, which at an annual production volume of c.30,000 vehicles represents a warranty cost of c.£240 million over an eight year product life cycle. These high levels of product warranty at launch were not realised by the business until five months post launch. By that time twelve thousand vehicles were in customers hands, and the resultant corrective actions were already chasing customer dissatisfaction.

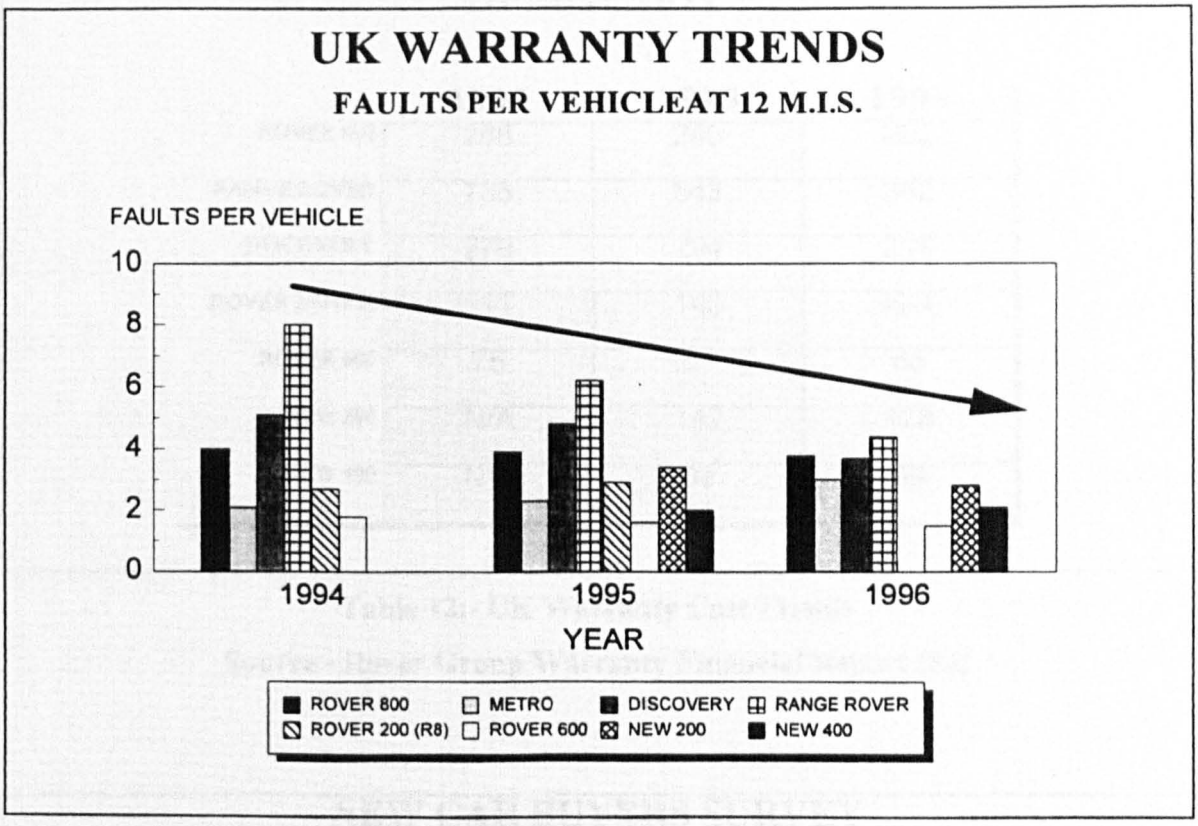


Figure 23:- UK Warranty Trends (FPV)

Source - Rover Group Warranty Financial Report {84}

Warranty cost trends and New Car Buyer Survey trends are shown in Table 12 and 13. The trends show a clear link between programmes delivered to PMP (Rover 600, New Rover 200 and 400) and low initial launch warranty. Programmes which did not apply PMP (Rover 800, Range Rover and Discovery) demonstrate high initial launch warranty. The New Car Buyers Survey trends show that the Rover 200, 400 and 600 show improvements in all categories except for dealer satisfaction and delivery timescales.

UK WARRANTY TRENDS

COST (£) AT 12 M.I.S.

	1994	1995	1996
ROVER 800	288	240	202
RANGE ROVER	765	543	392
DISCOVERY	279	294	216
ROVER 200 (R8)	111	143	N/A
ROVER 600	75	61	65
NEW 200	N/A	142	128
NEW 400	N/A	99	89

Table 12:- UK Warranty Cost Trends

Source - Rover Group Warranty Financial Report {84}

NEW CAR BUYERS SURVEY

TREND COMPARISONS RATED OUT OF 10
(OLD MODEL SHOWN IN BRACKETS)

	ROVER 200	ROVER 400	ROVER 600
PRODUCT SATISFACTION	8.0 (7.7)	8.0(7.7)	7.9 (7.6)
OVERALL QUALITY	8.2 (8.1)	8.1 (8.1)	8.1 (7.6)
FREEDOM FROM FAULTS	7.0 (6.9)	7.2 (6.9)	7.7 (6.6)
DEALER SATISFACTION	7.9 (7.9)	7.8 (7.9)	7.9 (7.7)
DELIVERY TIME	8.1 (8.3)	8.1 (8.3)	8.1 (8.2)

Table 13:- New Car Buyers Survey

Source - New Car Buyers Survey {83}

The Freelander warranty results are not available at the time of writing, but early indications are extremely promising. The build quality measures (Qz ratings) represent best in class levels at Rover Group, and the warranty is predicted to be at under 2 FPV at twelve months in service.

Business performance for Rover Group is demonstrating increased trends in terms of total annual sales and exports. The Rover Group internal communications magazine *"Torque"*, Issue Number 43, February 1998, stated that *"a strong export performance has led to Rover Group publishing its best world-wide sales for ten years"*. Total world-wide sales for 1997 were 521,000 vehicles (2.7% increase over 1996) with 56% of vehicles being exported. Further analysis of sales performance and quality trends is presented in Project Report Six.

6.4 Project Team Self-Assessment

The project team self-assessment reviews carried out confirmed that the new product introduction milestone of *"demonstrate compliance with the six Q&R prescriptives"* was on target. Therefore, the Common Business Environment framework of tools and techniques, including PMP, Reliability Management Process and Design Methodology were being deployed by new product project teams across the business. Project team recommended improvements to PMP which were captured in subsequent issues.

6.5 UK Quality Award

Rover Group was awarded the British Quality Foundation UK Quality Award in December 1994. The subjects covered in the seventy four page application included leadership, policy and strategy, people management, resources and processes. Whilst the award represented a significant media and public relations endorsement of Rover's progress in TQM deployment, in reality it was another significant step along the road to becoming a world class company. The section on policy and strategy described in detail the Rover Group Quality Strategy and stated *"the effectiveness of this deployment is evidenced by Rover Group's own independent audit and further confirmed by external audit (ISO 9001)"*. The section on process presented the Common Business Environment framework as *"the combination of an organisation radically changed to take advantage of technology, new operating philosophies and the Total Quality approach to deliver the company's strategic needs"*.

6.6 UK National Training Award

A review of the success of Focused Learning for the FMECA technique is shown in Table 14. This demonstrated implementation success as the following ratios show:

- Average training group size was 25 employees.
- 63% of the days run were attended by senior management.
- FMECA's started to days run was a ratio of 3.38.
- Average FMECA. team size was 7 employees.
- 5 senior managers were represented per FMECA. started.

PRODUCT SUPPLY BUSINESS UNIT	DAYS RUN	SEN. MGT. ATTENDANCE	FMECA's STARTED	TOTAL TRAINED
Body & Pressings	7	2	25	202
Cars Powertrain	6	5	24	180
Forward Programmes	7	7	17	121
Land Rover Power Train	3	2	8	57
Land Rover Vehicles	18	15	64	483
Large Cars	13	6	40	331
Small & Medium Cars	9	3	35	255
TOTAL	**63**	**40**	**213**	**1629**

Table 14:- Review Of Focused Learning

This approach formed the basis for deployment of the six Q&R prescriptives into all new project teams at Rover. An application for a UK National Training Award was submitted by the author {64}. This stated that *"over four thousand people have been involved in the learning processes designed to support new product introduction"* leading to:

- *Improved understanding of the new product introduction process.*
- *Competencies in application of Q&R tools and techniques.*
- *More conceptual thinking prior to design release.*
- *Improved communication between Rover and its suppliers.*
- *Raising the level of Q&R awareness amongst the senior management team.*
- *Simultaneous individual and corporate learning.*

DEMONSTRATION OF INNOVATION

7. DEMONSTRATION OF INNOVATION

7.1 Industry Perspective

Research into the evolution of quality in the automotive industry for 1990's revealed that *"emphasis on value will drive the acceptance of various standards including quality systems"*, and that the historical focus on commonisation of methodology such as SPC. will lead to emerging demands on quality professionals as resources and implementors of current, revised and yet to be developed technologies and methodologies. This provides a view that *"automotive quality and quality professionals will face uncharted but not unidentified waters"* {65}. A European and UK perspective of quality records that of the 2.9 million companies in the UK, there are only 1,400 members of the British Quality Foundation (BQF) and that the UK is not creating enough world-class companies as stated, *"our competitiveness nationally was average at 14 out of 41 companies"*. The BQF's annual UK Quality Award, which is based on the Baldridge and European Foundation for Quality management (EFQM), has already been won by Rover Group in 1994, demonstrating a UK level of best practice for quality management {66}.

7.2 Strategic Quality Planning

The identification of unchartered waters leads to the hypothesis that *"lack of synergy between the business and quality strategies often lies at the heart of performance problems"*, associated with the lacklustre impact of quality programmes on business success

{67}. Therefore it has been realised that strategic quality planning, integrating business and quality plans, can prevent inefficiencies and conflict. This requires *a "focused process for business planning to ensure that soft issues such as customer satisfaction and quality receive equal attention with other issues"* {68}.

Theoretical considerations to strategic issues in quality management leads to the hypothesis that *"strategic management and TQM should be treated as one integrated management process"*, which challenges the traditional authoritarian strategic planning models and encourages two-way communication {69}. But TQM programmes are typically aimed at the improvement of existing processes and variation, and can therefore lack a strategic change perspective. The Japanese take a much broader view of managing their business operations than Western organisations, leading to a conclusion that *"in a number of Western organisations TQC is sometimes viewed as an alternative strategy ..... there is a tendency in the West not to take a long term view"* . In fact, in Europe (particularly in the UK), there is a tendency to rush through the planning process {70}.

7.3 Developing A Quality Strategy

A number of methodologies are suggested for developing a strategic approach for quality planning, and in particular, ensuring that the quality plan is integrated within the business plan. A review of traditional management theory regarding strategic planning, business

results management, motivational theory, organisational culture and management by objectives leads to the conclusion that whilst representing important characteristics and criteria for managing the business, none specifically address the issue of strategic quality management. Therefore an alternative conceptual model has been recommended which shows how TQM, together with strategic analysis, impacts the strategic business mission {71}. But this does not fully capture the interaction and information flows between the strategic analysis and TQM.

Strategic Quality Management (SQM) is defined as a technique applied in the US as *"a systematic approach for setting and meeting quality goals throughout the company"*, which originated in the 1980's based on the theory of the quality guru, Juran {72}. SQM proposes that an approach to quality planning should include co-ordination of quality goals with overall business objectives, and a careful review of the links between quality and profitability in terms of increased market share, customer loyalty and reduction of quality costs. Alternative approaches to strategic quality management include application of techniques such as matrices, in particular Quality Function Deployment (QFD), which can ensure the planning process does not lose focus as it moves to levels of greater detail {68}. In Japan, the approach to strategic quality management is based on a novel technique known as *"Hoshin Kanri"* or *"Policy Deployment"* {40, 41}.

It is proposed that the critical issue in strategic quality management for Western businesses, is to recognise and revive TQM programmes that have either stalled (refer to Figure 7), or are suffering from an increased effort versus results ratio that is failing to deliver business results. The revival of the TQM programme requires the development of a company wide quality strategy, which integrates quality planning and business planning as a methodology for managing the business. The major issue facing companies, is the selection, development and implementation of a suitable process for developing a quality strategy.

7.4 Hoshin Kanri Policy Deployment

The technique of Hoshin Kanri has been described in Project Report Two, and summarised in Chapter 4.7 of this Executive Summary. Over the past twenty five years Hoshin Kanri has been an essential feature of modern Japanese management. The literal definitions are Hoshin (shining metal) and Kanri (pointing direction). Other translations have included policy deployment, management by policy, management by planning, and Hoshin Planning {41}. Hoshin Kanri is a systematic method for focusing the activities of an organisation on critical breakthrough areas and achieving integration between quality and strategic management. It is described as a technique that offers a much more elaborate conceptual framework on deployment issues than SQM. In short, the unique intention is to improve consistency between strategic goals and the daily activities of the business.

7.5 Application Of Hoshin Kanri

Hoshin Kanri replaced Management By Objectives (which was popular in Japan in the 1960's) because it was seen to be more flexible in dealing with quickly changing economic situations {41}. The technique was originally developed by Komatsu in 1965 in the form of a *"flag system"*, to speed the transition from Statistical Process Control to Total Quality Control. This was improved in the 1970's by the Tamagawa University in Japan, who introduced the target/means matrix as a way of clarifying measures, control items and control points. In the 1980's Nyatani expanded the use of this system by showing it could be enhanced with seven management tools {41}.

Industrial applications of Hoshin Kanri have tended to be focused on Japanese companies such as Yokagawa Hewlett-Packard {69}, Komatsu and Toyota {70, 73}. A study of Toyota's application revealed that in 1976 Toyota Autobody embarked upon a long term management plan with the specific objective of establishing an overall management control system on a purpose orientated nature {73}. Hoshin planning was used as the fundamental technique for developing the basic policy and clear management concepts. The long term plan was aimed at improving the quality of the plans for the annual policy and implementation plans. Under the long term plan basic targets were set for each function and deployed down to individual department levels. The status of the annual policy and departmental plans were checked by the *"total company check"* project that involves a

monthly review to understand problems and confirm corrective actions. Self examination of problems was arranged in order to properly reflect for next years plan.

Examples of Hoshin Kanri application within Western companies revealed a handful of practitioners within the US. These included NovAtel {74}, Xerox {75}, Hewlett-Packard {76}, Texas Instruments {77} and Intel {78}. No examples of Hoshin Kanri or Policy Deployment were identified in the European business community, or any world-wide automotive companies other than Toyota in Japan. This was validated in the form of a data base search, and the attendance at the eleven international conferences.

The other published work identified tended to be in the form of theoretical descriptions of Hoshin Kanri, and observations on its general lack of application in the West. Hacker and Kleiner {79} reported that whilst many companies were struggling to achieve objectives through their TQM efforts (quoting an Arthur D. Little survey, which reported that only 36% of respondents reported that TQM was having a significant impact on their ability to achieve objectives). Their observation of anecdotal data was that *"successful companies in Japan and North America are applying policy deployment to operationalise TQ"*, yet whilst Japanese companies have been refining Hoshin Kanri for nearly twenty five years, *"policy deployment in the United States though remains in its infancy"* {79}. Farina {80} describes a theoretical application of policy deployment as a model for implementing TQM training. Munshi {81} provides an insight to the common pitfalls associated with policy deployment,

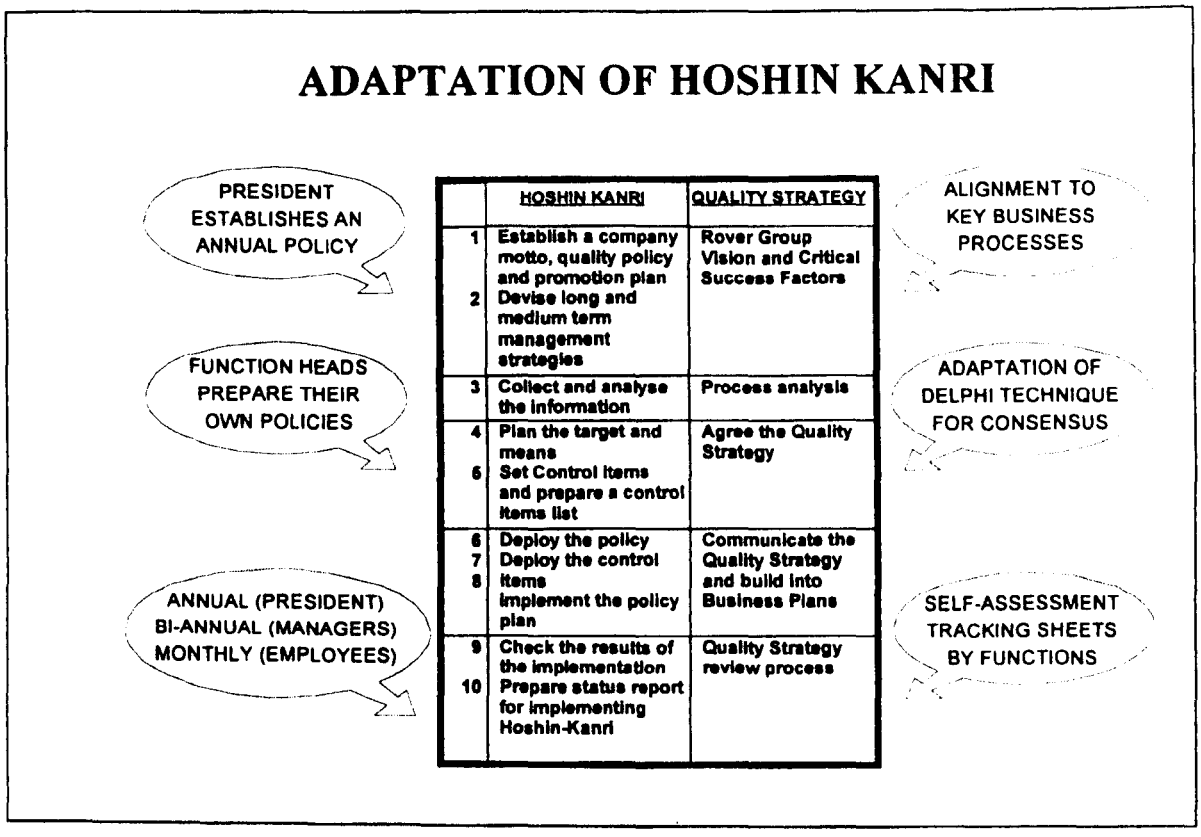
including failure to integrate it with TQM, no connection with process management and inadequate cross functional management. Witcher and Butterworth (University of East Anglia, Norwich, UK) {82} provide a preliminary overview of Hoshin Kanri and quote *"this will move the organisation to the right position in the market place"* but do not describe any practical examples from the UK or Europe. This is a current piece of research that demonstrates Rover's lead in the application of Hoshin Kanri Policy Deployment. Furthermore, Xerox have in fact used the Rover case study as a benchmark on policy deployment {75}.

7.6 Rover Group Quality Strategy

Deployment of the Rover Group Quality Strategy across the business down to team plans and individual level Performance Development Reviews (PDR's), as shown previously in the model in Figure 16 and demonstrated in the examples in Appendix 6 and 7, represents an extensive application of Hoshin Kanri Policy Deployment in a major Western automotive company.

The claim for innovation is based on the implementation of a significant Japanese strategic management planning tool at Rover, which represents a robust methodology for planning and measuring the business objectives through quality improvement milestones for each of the key business processes. The approach taken at Rover includes a novel adaptation of the

Delphi Group Judgement technique for setting the milestones and achieving consensus within the business. Table 15 shows the adaptation of Hoshin Kanri as applied to the Rover Group Quality Strategy, with the application of the modified Delphi Group Judgement technique to achieve consensus, and application of self-assessment tracking sheets by functions to measure progress.



	HOSHIN KANRI	QUALITY STRATEGY
1 2	Establish a company motto, quality policy and promotion plan Devise long and medium term management strategies	Rover Group Vision and Critical Success Factors
3	Collect and analyse the information	Process analysis
4 5	Plan the target and means Set Control Items and prepare a control items list	Agree the Quality Strategy
6 7 8	Deploy the policy Deploy the control items Implement the policy plan	Communicate the Quality Strategy and build into Business Plans
9 10	Check the results of the implementation Prepare status report for implementing Hoshin-Kanri	Quality Strategy review process

Table 15:- Adaptation Of Hoshin Kanri

The Rover Group Quality Strategy has been published to the company's management population for inclusion in functional business plans, management action plans and personal development reviews since 1992. Progress against the quality strategy is regularly reviewed,

by adopting measures which initially started as an audit process, and has progressively evolved into a self assessment review. The quality strategy is currently on its seventh iteration and identifies improvement milestones to the millennium. This represents a significant approach to integrating and aligning the business and quality plans of a major European automotive manufacturer. The longevity of the Rover Group Quality Strategy justifies the view, that it cannot be dismissed as the latest management fad within the company. It has currently survived the test of three Chief Executives and BMW ownership. The recently appointed quality director of Rover Group is a quality professional from BMW, who has reinforced commitment to the quality strategy process, when faced with the possible alternative of eliminating it from the company's management operating procedures.

7.7 Project Management Policy

The quality strategy deployment methodology has been rigorously tested with the establishment and implementation of PMP as company policy for all new product teams at Rover Group. The re-engineering project for PMP has led to the creation of a process document for new product introduction which has been deployed on six major product programmes at Rover. PMP has been established as company policy by inclusion in the Rover Group Quality Policy document, which states the following under section D for Product and Programme Planning: *"Plans will be developed to meet customer requirements and operational needs of the business, and to reduce environmental impacts The Project Management Policy defines the project control system and supporting processes"*. This is in

effect the company's overall quality policy for compliance to ISO9001:Part 1, and as such means that PMP compliance has been measured externally by the Vehicle Certification Agency (VCA) in their regular surveillance audit visits at Rover Group.

The claim for innovation for PMP is that it represents a significant application of Group Judgement Techniques used in its original creation from collaboration with Honda, and that it has been extensively communicated and applied at Rover Group through a novel training approach known as Focused Learning. This has been achieved as a direct result of Hoshin Kanri Policy Deployment from the quality strategy.

CONCLUSIONS

8. CONCLUSIONS

1. Rover Group's revival in the 1980's based on rationalisation, new products and introduction of improved working practices between the management, workforce and trade unions did not achieve sufficient improved business results in terms of UK market share, customer satisfaction and company image (pages 4-6).

2. Rover Group's Total Quality Improvement (TQI) programme, although demonstrated initial success in terms of employee involvement through Quality Action Teams and the Suggestion Scheme was not sufficient to sustain ongoing systematic quality improvement (pages 8-13).

3. Research of TQM implementation in companies across Europe and America revealed that most successful programmes were based on long term quality strategies which were systematic, results driven and led by senior managers within the business (page 31).

4. Research of strategic planning methodologies concluded that the quality strategy would need to declare the strategic intent for the business, involve line managers in the development process, be communicated effectively and regularly reviewed if it was to harness and direct resources to achieving common business goals (pages 32-36).

5. Research into Group Judgement methodologies led to the development of a consensus building process based on the Delphi Techniques, involving seven hundred managers across Rover, to agree improvement milestones for the key business processes that drive Rover Group (page 56-57).

6. The Rover Group Quality Strategy was created and documented in a one page format that identified eighty-nine improvement milestones for the nine key business processes over a five year planning horizon (page 57).

7. Research of management theory led to the conclusion that the Japanese methodology of Hoshin Kanri Policy Deployment should be used to implement the quality strategy (pages 38-45).

8. Hoshin Kanri Policy Deployment led to a rigorous review process for the quality strategy milestones, which established progress, and up-dated the quality strategy on an annual basis (page 70).

9. Collaboration with Honda on joint product programmes in the 1980's resulted in product development process learning that was documented as Project Management Guidelines (page 59).

10. An analysis of Programme Management Guidelines concluded that it did not sufficiently capture the scope of new product introduction and the implementation across Rover product programmes was weak (page 59).

11. Research into the new product introduction processes at automotive companies in Europe, Japan and the US showed marked differences in product development performance compared with the 1980's in terms of lead time, productivity and quality index. European companies tended to be worse in terms of relative performance during the 1990's despite deployment of simultaneous engineering approaches (pages 45-48).

12. Performance variation in new product development was due to differing philosophies such as interface management of upstream and downstream activities, overlapping product and process development and focusing on lead times associated with planning (pages 49-50).

13. Companies involved in new product introduction (including automotive) tend to define and document their new product introduction process as a series of phases that vary in terms of their scope and detail (pages 50-52).

14. There is little evidence of companies applying a continued learning process being used to refine and up-date the procedures and documents for new product introduction (page 51).

15. The new product introduction process at Rover Group has been defined and documented in Project Management Policy (PMP), using the adapted Delphi Technique developed for the quality strategy (pages 59-61).

16. Tools and techniques for improving quality and reliability are numerous and well documented. To benefit from application of tools and techniques, they must be applied at an early stage of the new product introduction process, to gain advantage of the relatively low cost of product change, compared with the high levels of design influence at the process front end stages (pages 52-54).

17. Research has shown that many companies apply Q&R tools, such as FMECA., primarily because this represents a contractual requirement of one or more customers (page 54).

18. Organisational culture can have a major effect on the application of Q&R tools within the business. This leads to the realisation that application relies partly on achieving mutual alignment of organisational attributes and activities (page 55).

19. The Common Business Environment framework was developed at Rover, to establish a methodology of processes, tools and techniques for application on new product programmes, and build on the implementation of PMP (pages 62-64).

20. The Rover Design Methodology and Rover Reliability Management Process were developed and implemented on new product teams, as a mechanism for improving product design decisions and application of reliability planning techniques (pages 63-64).

21. The six Q&R prescriptives were identified as policy for deployment into new product project teams to ensure consistency of approach (page 65).

22. The Common Business Environment framework of PMP, Design Methodology and Reliability Management Process were deployed into project teams using the training approach, known as focused learning, resulting in reduced lead times and improved initial launch quality (pages 67-68, 70-73 & 74-78).

23. PMP has become part of the language of Rover Group with ongoing learning, review and up-dates being the normal practice within the new product introduction process, demonstrating that Rover is a strong leader in terms of capability to deploy PMP as a means of retaining a competitive advantage in the new product introduction process (pages 66-67 & 78).

24. The extensive application of Hoshin Kanri Policy Deployment at Rover represents innovation within a non- Japanese automotive manufacturer, and a major European automotive manufacturer (pages 81-90).

25. An assessment of the claims for deployment of the Rover Group Quality Strategy, PMP and CBE was made with the UK Quality Award application that Rover won in 1994 (page 79).

26. The deployment of PMP at Rover has been audited by the Vehicle Certification Agency (VCA) without any major non-compliance's (pages 89-90).

PROPOSALS FOR EXTENSION OF THIS WORK

9. PROPOSALS FOR EXTENSION OF THIS WORK

The author has been involved in the research, development and application of quality management, policy deployment and new product introduction processes for ten years. There have been numerous issues that have arisen outside the scope of this Engineering Doctorate portfolio that are worthy of further study. These can be described under the headings of strategic, operational and detail. A brief overview of some of these issues is presented here.

9.1 Strategic

A review of Rover's PMP methodology for new product introduction and BMW's gateways in new product development should be carried out, with the objective of developing a group approach for new product introduction. This is of particular importance as the two companies begin to commence joint development of product programmes and share common components and systems on vehicle programmes.

This should take account of industry trends for further reducing lead time and improving product launch quality, by considering opportunities for de-coupling system engineering pre-development from vehicle programme delivery. Focused learning principles should be applied to cascade the revised PMP/Gateway process, to ensure robust implementation and consistency across the Group.

9.2 Operational

The latest approaches for *"electronic vehicle build"* should be incorporated into PMP as a means of reducing the quantity of physical prototypes required at the D02 phase within the route map.

The principles of PMP and Common Business Environment within the new product introduction process should be reviewed with a view to developing a Manufacturing Quality Policy (MQP) for Rover's manufacturing operations. The learning points for fast tracking the development of organisational competencies for developing and implementing MQP should be comprehensively reviewed.

9.3 Detail

A computer system data-base should be developed to achieve an integrated tracking system for the quality strategy milestone measures, which could be networked to allow process owners the ability to up-date progress in real time, and enable the creation of senior management reports.

The design methodology should be developed to allow design decision records to be stored on the company's engineering data base, rather than rely on paper records.

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APPENDICES

12. APPENDICES

- Appendix 1:- Innovation Framework
- Appendix 2:- International Conferences Attended
- Appendix 3:- Rover Group Quality Strategy
- Appendix 4:- Quality Strategy Deployment
- Appendix 5:- Quality Strategy Review
- Appendix 6:- PMP Success Criteria
- Appendix 7:- Rover Design Methodology
- Appendix 8:- Reliability Management Process
- Appendix 9:- Project Team Self-Assessment Process
- Appendix 10:- Focused Learning Approach

APPENDIX 1

INNOVATION FRAMEWORK

INNOVATION FRAMEWORK

The innovation framework was used during the project work research and implementation, to establish areas of innovation, either in developing new processes or applying established processes in a different application. Each project report within the portfolio has a documented questionnaire as shown in the example below for Project Report One.

No	TEST	RESPONSE	PAGE No.
1	What aspects of the project are entirely new?	Development and deployment of Business Process Re-Engineering (BPR) technique for company wide Quality Strategy up to 1995 including communication of strategy to total management population across all Business Units and Functions.	89 - 116
2	What aspects of the project have been done elsewhere but not yet applied to your own industry or business situation?	Business Process Re-Engineering now a developed approach across most business sectors. Similar Quality Strategy communication process applied at Caterpillar although this was a retrospective review of a five year horizon with a rolling annual plan period.	76 - 82
3	Are there significant alternative ways of tackling the task, 'thus allowing greater scope for innovation' or is the main path already determined?	Main path for developing Quality Strategy determined during 1991 and 1992. Methodology was based on flow charting the nine macro company processes, carrying a major diagnostic review of the critical issues and using management stakeholder groups to identify and gain consensus of the process improvement milestones.	98 - 106
4	What do you perceive as the main areas of innovation?	Business Process Re-Engineering applied to identify the nine key business processes and develop the companies five year quality strategy. A combination of Delphi and Social Judgement techniques was used to involve approximately 700 key managers from all areas of the business in the quality strategy development process. This resulted in improvement milestones being identified for the key business processes. The Rover Group Quality Strategy was communicated to all company managers in a novel one page format.	89 - 116
5	How relevant is the innovation to: 1. Your own company? 2. Your own industry? 3. All industries?	 Setting strategic quality priorities critical in Automotive industry. Generic process including milestones identified could be applicable. Quality Strategy process potentially generic to all business sectors.	 37 - 47 67 - 88 67 - 88
6	What new processes/materials/techniques, procedures will arise from this project that will create better options for action in the future?	Novel process for involvement of key stakeholders in developing the Quality Strategy and deploying the plan to all 3500 company managers using a unique A3 one page format encapsulating all critical quality improvement milestones. Format has been adopted up to year 2000.	106 - 113
7	How will the project contribute to a greater understanding of the subject area and its contribution to the business environment?	By adopting a company-wide communication and implementation strategy led by the Board of Directors which involves every manager within the business. This contributes to an improved level of understanding of the critical quality issues and processes to be adopted to sustain business improvement.	113 - 116
8	Will the outcome of the project be worthy of wider dissemination eg through publication and conferences?	The Rover Group Quality Strategy process has been presented at conferences across Europe and South East Asia over the period 1993 to 1995.	Separate portfolio submission
9	What would be the effects on the business of NOT going ahead with the project?	Insufficient understanding and management attention to strategic quality issues leading to poor product and service quality and ultimate failure in one of the most competitive world wide business sectors.	37 - 47
10	On what information/experience have you based your answers to the above questions? For example, do you know what other companies and research institutions, or parts of your organisation have tackled similar problems?	Research into TQM, strategic planning, Business Process Re-Engineering and Group Judgement techniques has been carried out to identify similar problems and potential solutions. This research included benchmarking the quality strategy process with industry leading organsiations. The approach applied at Rover has been recognised on an international level by making presentations at international conferences on the subject of Business Process Re-Engineering and Quality and Reliability.	48 - 88

Project Report One Innovation Questionnaire

APPENDIX 2

INTERNATIONAL CONFERENCES ATTENDED

The following is a list of conferences attended at which the author gave presentations of various aspects of project work carried out during the Eng.D. The title of the conference attended; location, date and title of presentation given by author is shown in chronological order as follows:

- Accurately Measuring the Cost of Quality Conference, *"The Road To Continuous Improvement - A Circular Process Of Constantly Refining And Improving Your Quality Systems"*, London, 9th-10th December 1991.
- Benchmarking & Total Quality Management Conference, *"Benchmarking And Total Quality Management"*, Helsinki, 11th June 1992.
- 1992 Testing For Quality Conference, *"Testing For Quality And Total Quality Management"*, Birmingham, 15th September 1992.
- Business Process Restructuring Conference, *"Developing a Quality Strategy at Rover Group by Focusing on Key Business Processes"*, London, 7th-8th June 1993.
- Business Process Re-Engineering Conference, *"Enhancing the Quality Strategy by Focusing on Key Business Processes"*, London, 28th-29th September 1993.
- Effective Quality Management Conference, *"Communicating Your Quality Objectives"*, Amsterdam, 25th-26th November 1993.
- 1st International Conference On Quality & Reliability, *"Quality & Reliability Through Common Business Environment"*, Hong Kong, 11th-12th April 1995.
- Business Process Transformation: Making Strategy Happen, *"Translating Customer Needs into Measurable Performance Targets and Ensuring Your Business Processes are Focused to Achieve These"*, London, 13th-14th June 1995.
- Business Process Re-Engineering, *"Enhancing The Quality Strategy By Focusing On Key Business Processes"*, Singapore, 7th-8th September 1994.
- 5th International Congress, European Automobile Engineers Co-operation, *"Common Business Environment For Lean Product Development"*, Strasbourg, 21st-23rd June 1995.
- Business Performance Measurement Conference, Business Intelligence, *"Self Assessment In Practice: Applying The EFQM Model At Rover"*, London, 7th-8th November 1995.

APPENDIX 3

ROVER GROUP QUALITY STRATEGY

THE ROVER GROUP VISION
Rover is internationally renowned for extraordinary customer satisfaction

QUALITY STRATEGY

ISSUE 4
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ROVER GROUP
LAND-ROVER ROVER

ROVER GROUP Quality Council
J TOWERS
GROUP MANAGING DIRECTOR

Primary driver ●
Strong connection ○

PROCESS	1991	1992	1993	1994	1995	PROCESS VISION	GROW IN EUROPE	REDUCE BREAKEVEN	MOVE UPMARKET	CUSTOMER SATISFACTION	RELATED INITIATIVE & CHAMPION
NEW PRODUCT INTRODUCTION	BENCHMARK WORLD CLASS QUALITY & RELIABILITY ALL NEW PRODUCTS DELIVER CORPORATE PLAN RETURN ON SALES DEMONSTRATE UNDERSTANDING OF AND BUY INTO NEW PRODUCT DEVELOPMENT PROCESS	PROJECT MILESTONE EVENTS DEMONSTRATE ALL PROGRAMMES ARE IN CONTROL MEASURED BY KEY TASK ACHIEVEMENT PUBLISH 200 ROVER BLUEPRINT DESIGNS 200 STRATEGIC SUPPLIERS SUPPORTING THE DESIGN AND DEVELOPMENT PROCESS	N2.1: ACHIEVE WORLD CLASS LEVELS OF TRAINING AND APPLICATION OF QUALITY AND RELIABILITY TECHNIQUES N2.2 IMPLEMENT A STRUCTURED PROCESS FOR LEARNING FROM PROJECT TEAMS N2.3: ALL PRODUCTS SPECIFIED WITH CUSTOMER TARGETING PROCESS	*N4.1:* 70% OF ENGINEERING CHANGE IS IDENTIFIED BEFORE THE D1 EVENT ON ALL PROGRAMMES *N4.2:* ALL PARTS TO PRODUCTION STANDARD AT QP *N4.3:* PRODUCT COMPLEXITY EQUIVALENT TO BENCHMARK COMPANY IN ITS DOMESTIC MARKET *N4.4:* 'EFFECTIVE COST MANAGEMENT' APPLIED TO ALL NEW PROJECTS *N4.5:* ALL PROJECT TEAMS CAN DEMONSTRATE COMPLIANCE WITH THE 8 QUALITY AND RELIABILITY PRESCRIPTIVES	*N5.1:* ACHIEVE WORLD BEST IN CLASS QUALITY AND RELIABILITY IN EACH PRODUCT SECTOR *N5.2:* PROJECT TEAMS DEVELOP IMPROVEMENT PLANS BASED ON Q&R SELF ASSESSMENTS	WORLD BEST IN CLASS QUALITY AND RELIABILITY IN EACH PRODUCT SECTOR	○ ○	● 	● ●	● ●	QUALITY AND RELIABILITY INITIATIVE A Curtis CUSTOMER TARGETED PRODUCTS N J Stephenson
MANUFACTURE	BENCHMARK COMPETITOR PRACTICES ON KEY PROCESSES	IDENTIFY AND MEASURE PROCESS CAPABILITY OF MACHINING AND BODY IN WHITE OPERATIONS ALL MANUFACTURING OPERATIONS TO HAVE TEAMS OF 10 TO 15 TRAINED IN PROBLEM SOLVING AND TEAMWORK ESTABLISH A CONTROLLED PROCESS FOR PROCESS CHANGE THAT REBUILTS ON NO ADVERSE EFFECT ON QUALITY MEASURES WITH ASSIGNMENT OR SHIFT PATTERN CHANGE	M3.1 ACHIEVE QUALITY AND RELIABILITY EQUAL TO BEST EUROPEAN MASS PRODUCER M3.2: EACH BUSINESS UNIT IDENTIFIES 4 KEY AREAS OF WASTE AND REDUCES THEM BY 50% IN THE YEAR M3.3: WARRANTY COSTS ACHIEVED AT 0.5% OF NET SALES REVENUE ON CARS AND 1.2% OF NET SALES REVENUE ON 4X4 M3.4 PUBLISH A WORKING ENVIRONMENT STANDARD	*M4.1:* ACHIEVE PROCESS CAPABILITY OBJECTIVES • Cp=Cpk=2.0 ON CRITICAL MACHINING OPERATIONS • Cp=Cpk=1.3 ON OTHER MACHINING OPERATIONS • CRITICAL POINTS CHECK ON BODY LESS DOORS BETTER THAN 90%± 1.5mm *M4.2:* ACHIEVE WORLD BEST IN CLASS RIGHT FIRST TIME LEVELS ON PAINT, VEHICLE ASSEMBLY AND POWERTRAIN ASSEMBLY OPERATIONS *M4.3:* WORK LIMITED ONLY BY SKILL AND SAFETY	*M5.1:* ACHIEVE THE OBJECTIVE OF WORLD BEST IN CLASS BUILD QUALITY BY MODEL	WORLD BEST IN CLASS BUILD QUALITY BY MODEL	●	○	●	●	No. 1 NEW CARS BUYERS SURVEY Rover Group Quality Council
MAINTENANCE	BENCHMARK WORLD CLASS MAINTENANCE PRACTICE (ONGOING PROCESS AFTER 1991) DETERMINE ROVER GROUP MAINTENANCE PLAN DETERMINE OBJECTIVES, SCOPE AND ORGANISATION OF MAINTENANCE INCLUDING SPARES AND ASSET IMPROVEMENT STRATEGY FOR EACH BUSINESS UNIT DETERMINE MAINTENANCE SYSTEMS STRATEGY	INTRODUCE TPM TO 30% OF MANUFACTURING ASSOCIATES AND IMPLEMENT STEPS 1 TO 3 OF AUTONOMOUS MAINTENANCE IMPLEMENT MAINTENANCE PERFORMANCE MEASUREMENT PROCESS WHICH IS LINKED TO MAINTENANCE OBJECTIVES ESTABLISH THE COST OF THE 6 BIG LOSSES ESTABLISH A PROCESS WHICH INVOLVES MAINTENANCE AND MANUFACTURING IN MANUFACTURING ENGINEERING FROM CONCEPT TO COMMISSIONING	T3.1 ACHIEVE STEPS 1 TO 4 OF AUTONOMOUS MAINTENANCE WITHIN THE TPM APPROACH T3.2: EACH BUSINESS UNIT HAS DEVELOPED AND IMPLEMENTED A COMPUTERISED MAINTENANCE PACKAGE	*T4.1:* ROBUST TPM AUDIT PROCESS ESTABLISHED	*T5.1:* ACHIEVE STEPS 5 TO 7 OF AUTONOMOUS MAINTENANCE WITHIN THE TPM APPROACH	WORLD BEST OVERALL EQUIPMENT EFFECTIVENESS		●		●	TOTAL PRODUCTIVE MAINTENANCE J P Briffitt
LOGISTICS *NOTE: THE LOGISTICS PROCESS COVERS ALL ACTIVITIES CONCERNED WITH PROCUREMENT, SCHEDULING, TRANSPORT AND DISTRIBUTION FROM FORECASTING AND SALES ORDER ENTRY TO DELIVERY TO THE DEALER*	ESTABLISH LEADTIME AND STOCK MONITORS TO ALLOW EFFECTIVE MONITORING OF RETAIL SOLD ORDER LEAD TIME PERFORMANCE IDENTIFY AND MEASURE CRITICAL / HIGH VALUE COMPONENT 'F' TIMES 100% ACHIEVEMENT TO WEEKLY SEQUENCED PLAN CRITICAL / HIGH VALUE SUPPLIERS TO COMMENCE INTEGRATION INTO ROVER PROCESSES	100% ACHIEVEMENT TO WEEKLY PLAN COMMUNICATE LOGISTICS STRATEGY DETERMINE A STRATEGY FOR SUPPLIERS, DELIVERY METHODS AND LOGISTICS MEASURE ALL CRITICAL HIGH VALUE COMPONENT 'F' TIMES ESTABLISH TARGETS FOR CONSISTENT THROUGHPUT TIMES PASS TO SALES BY DUE WEEK, 75%, 25% +/- 1 WEEK 100 KEY SUPPLIERS ASSESSED TO RQ2000 SUPPLIER COMPONENT STATUS REPORT (SCSR) LAUNCHED 50% OF SUPPLIERS ACHIEVE BS 5750	L3.1 SUPPLIER COMPONENT STATUS REPORT FULLY IMPLEMENTED L3.2 CO-ORDINATED INFORMATIONAL LOGISTICS STRATEGY IN PLACE L3.3 SUPPLIER DEVELOPMENT TEAMS OPERATING IN 100 STRATEGIC SUPPLIERS L3.4 RELIABLE DELIVERY PROMISE DATE TO THE CUSTOMER L3.5 100% ACHIEVEMENT TO DAILY PLAN L3.6 PASS TO SALES BY DUE WEEK 85%, 20+/- 2 DAYS L3.7 ALL KEY SUPPLIERS ASSESSED TO RQ2000 L3.8 10% IMPROVEMENT ON RQ2000 SCORES 1 YEAR AFTER INITIAL ASSESSMENT L3.9 ROVER TOMORROW 'SUPPLIER BEST PRACTICE' PHASE	*L4.1:* 10% IMPROVEMENT IN RQ2000 SCORES 2 YEARS AFTER INITIAL ASSESSMENT *L4.2:* EUROPEAN STOCK COVER 1.5 MONTHS	*L5.1:* DELIVER FINISHED VEHICLES TO DEALERS: 3 DAYS IN UK; 5 DAYS IN WESTERN EUROPE *L5.2:* CUSTOMER ORDER PLACEMENT TO DESPATCH REDUCED TO 1 WEEK *L5.3:* TOTAL COMPANY STOCK TURN BEST IN CLASS *L5.4:* 100% ACCURATE BILL OF MATERIAL *L5.5:* IMPLEMENT SINGLE BILL OF MATERIAL SYSTEM *L5.6:* PASS TO SALES BY DUE DATE 98%, 2%+/- 2 DAYS *L5.7:* 5% IMPROVEMENT IN RQ2000 SCORES 3 YEARS AFTER INITIAL ASSESSMENT *L5.8:* RELIABLE DELIVERY PROMISE TO THE CUSTOMER AT POINT OF ORDER *L5.9:* ELIMINATE PERMANENT VEHICLE STOCKS *L5.10:* 300PPM AVERAGE INTO PLANT QUALITY FOR ALL SUPPLIERS (TARGET FOR AN INDIVIDUAL SUPPLIER REMAINS ZERO PPM)	GIVING OUR CUSTOMERS WHAT THEY WANT WHEN THEY WANT IT AT MINIMUM TOTAL COST	○	●	○	●	DISTRIBUTION EFFICIENCY AND COMPANY WIDE JUST-IN-TIME G J Morris
SALES & SERVICE	DEVELOP AND PILOT DEALER NETWORK TQI AND QUALITY ASSURANCE TRAINING PACKAGE PRODUCE BEST PRACTICE DEALER PROCESSES REVISE DEALER STANDARDS / CUSTOMER RESEARCH	EUROPEAN STANDARDS AND CUSTOMER RESEARCH DEALER OWNED CUSTOMER RESEARCH / TRACKING ALL DEALERS SUCCESSFULLY IMPLEMENT REVISED FRANCHISE STANDARDS FIELD FORCE TRAINED IN TQI / PROCESS FACILITATION 50% OF ALL DEALER STAFF TRAINED IN TOTAL QUALITY IMPROVEMENT AND QUALITY ASSURANCE	S2.1 ALL UK DEALERS COMPLETED THE CSI II OR TCS PROGRAMME IN QUALITY MANAGEMENT AND CUSTOMER SERVICE S2.2 COMPREHENSIVE MEASURES FOR CUSTOMER SATISFACTION IMPLEMENTED IN ALL NSCs AND 20 KEY DISTRIBUTOR MARKETS	*S4.1:* 100% OF UK NETWORK MEETS BS5750 QUALITY MANAGEMENT STANDARD *S4.2:* EACH SALES REGION IDENTIFIES 3 KEY AREAS OF WASTE AND REDUCES THEM BY 50% IN THE YEAR	*S5.1:* DEALER NETWORK IN TOP THREE FOR OVERALL CUSTOMER SATISFACTION ON ECSS IN EUROPE AND ON LOCAL MEASURES IN NSCs AND 20 KEY DISTRIBUTOR MARKETS *S5.2:* WORLD BEST IN CLASS CUSTOMER RETENTION *S5.3:* ALL EUROPEAN, NSC AND 20 KEY DISTRIBUTOR MARKET DEALERS MEET ISO 9002 REQUIREMENTS S5.4: ALL EUROPEAN DEALERS COMPLETE CSI II OR TCS PROCESS *S5.5:* VEHICLE PREPARATION WITHIN 2 DAYS BY UK AND WESTERN EUROPEAN DEALERS	DEALER NETWORK IN TOP THREE IN ALL MARKETS	●		●	●	BEST DEALER IN TOWN J M Parkinson
CORPORATE LEARNING		75% OF ALL ASSOCIATES HAVE AGREED FOR A PERSONAL DEVELOPMENT PLAN AND HAVE HAD AT LEAST ONE DISCUSSION WITH THEIR LINE MANAGER AFTER COMPLETING IT ESTABLISH AN ACCESSIBLE NETWORK OF SUBJECT SPECIALISTS AND A KNOWLEDGE DATABASE INCORPORATE LEARNING REQUIREMENT INTO EVERY PACP OR MAJOR CHANGE PROGRAMME PROPOSAL DEMONSTRATING BENEFITS ESTABLISH ACTION PLANS FOR ACHIEVING EFFECTIVE NETWORKING ACROSS ROVER GROUP	C2.1 95% OF ALL ASSOCIATES HAVE AN ACTIVE PDP C2.2: ACHIEVE TARGET OF 80% OF INDIVIDUAL DEVELOPMENT PLANS AGREED BY LINE MANAGERS C2.3 10% INCREMENT PER ANNUM IN AWARD OF CERTIFICATES OF ACHIEVEMENT FROM NVQ BENCHMARK OF 1995 EMPLOYEES RECEIVING CERTIFICATES ANNUALLY C2.4 IMPLEMENT INTERNAL DEVELOPMENT REVIEW (PDR) PROCESS	*C4.1:* 75% OF LINE MANAGERS CAN DEMONSTRATE A SIGNIFICANT APPLICATION OF THE CORPORATE LEARNING PROCESS *C4.2:* ALL BUSINESS UNITS AND FUNCTIONS ACHIEVE SELF ASSESSMENT SCORES AT LEAST EQUAL TO EUROPEAN QUALITY AWARD (EQA) PRIZE-WINNING LEVELS	*C5.1:* ACHIEVE WORLD BEST IN CLASS LEARNING COMPANY BASED ON BENCHMARKED CRITERIA *C5.2:* ALL BUSINESS UNITS AND FUNCTIONS ACHIEVE SELF ASSESSMENT SCORES AT LEAST EQUAL TO EQA AWARD-WINNING LEVELS	WORLD BEST IN CLASS LEARNING COMPANY	●	●	●	●	SUCCESS THROUGH PEOPLE D G Bower
MANAGEMENT OF PEOPLE	BENCHMARK BEST PRACTICE MANAGEMENT PROCESSES AND MEASURES	TOTAL QUALITY LEADER CHANGE PLANS FOR ALL FUNCTIONS AND BUSINESS UNITS EACH AREA WITHIN THE BUSINESS ESTABLISHES AND MEASURES A ROBUST COMMUNICATIONS PROCESS	P2.1 EACH FUNCTION OR BUSINESS UNIT HAS AN ACTION PLAN FOR IMPROVING COMMUNICATION WITHIN THEIR GROUP, TO MEASURE IMPLEMENT ROVER TOMORROW • P2.2 ESTABLISH SINGLE VISIONS AND GRADING STRUCTURE • P2.3 COMPANY WIDE IMPLEMENTATION OF MEASUREMENT OF ROVER TOMORROW PROGRESS • P2.4 ACHIEVE CORPORATE PLAN PRODUCTIVITY TARGETS P2.5 ABSENCE LEVELS EQUAL TO UK BEST IN CLASS (LESS THAN 3%)	*P4.1:* ACHIEVE COMMUNICATIONS IMPROVEMENT TARGETS MEASURED BY VIEWPOINT '94 *P4.2:* ONE IMPROVEMENT CONTRIBUTION PER ASSOCIATE PER MONTH *P4.3:* ALL ASSOCIATES HAVE AN INDIVIDUAL SKILLS DEVELOPMENT PLAN	ACHIEVE WORLD CLASS LEVELS OF ASSOCIATE INVOLVEMENT IN IMPROVEMENT ACTIVITY:- • *P5.1:* ONE IMPROVEMENT CONTRIBUTION PER ASSOCIATE PER WEEK • *P5.2:* 70% OF ASSOCIATES ACTIVELY INVOLVED IN TEAM IMPROVEMENT ACTIVITIES *P5.3:* ACHIEVE WORLD CLASS LEVELS OF VALUE-ADDED PER ASSOCIATE	AN ENVIRONMENT WHERE ALL ASSOCIATES WILLINGLY GIVE THEIR BEST CONTRIBUTION	●	●	●	●	SUCCESS THROUGH PEOPLE D G Bower
PRODUCT IMPROVEMENT		IMPLEMENT CUSTOMER SERVICE MANAGEMENT SYSTEM (IT BASED SYSTEM) DEVELOP A SINGLE ROVER GROUP PROBLEM MANAGEMENT SYSTEM BASED ON 1994 PROCESS REVIEW DEVELOP A SINGLE ROVER GROUP PROBLEM MANAGEMENT PROCESS (COMMON BUSINESS SYSTEM) MEASURE TIME FROM RECOGNITION OF PROBLEM TO • TIME TO RESPOND TO CUSTOMER • TIME TO DEVELOP SERVICE FIX • TIME TO ENGINEER SOLUTION BENCHMARK WORLD CLASS LEVELS FOR RESPONDING TO PROBLEM WITH SOLUTIONS MEASURE INCREMENTAL LOADING OF RESOURCE ON NEW PRODUCTS ESTABLISH SKILLS PROFILE AND DEVELOP TEAM SKILLS WITH APPROPRIATE MEASURES	R2.1 REDUCE TIME FROM RECOGNITION OF PROBLEM TO SOLUTION BY 20% PER ANNUM	R4.1 DOUBLE SPEED OF CHANGE PROCESS FROM RELEASE TO IMPLEMENTATION R4.2: ACHIEVE WORLD CLASS LEVELS OF PROBLEM OWNERSHIP AND SOLVING BY MANUFACTURING TEAM LEADERS		WORLD BEST IN CLASS QUALITY AND RELIABILITY IN EACH PRODUCT SECTOR		●		●	EXTRAORDINARY CUSTOMER SERVICE J K Russell COMMON BUSINESS ENVIRONMENT N J Stephenson
BUSINESS PLANNING		ROVER GROUP BOARD DEFINES MISSION AND LONG TERM GOALS APPROVES PRODUCT PLAN AND ALLOCATES RESOURCES APPROVES THREE YEAR BUSINESS PLANS	B2.1 BUSINESS UNITS AND OTHER FUNCTIONS ESTABLISH PROCESS FOR MINIMUM PROVISIONS IN THE PLANNING CYCLE	*B4.1* ALL TEAMS HAVE DEFINED OBJECTIVES AND MEASURES ALIGNED TO COMPANY GOALS *B4.2* ROVER GROUP APPROVES A 15-YEAR OPERATIONS STRATEGY	*B5.1* DEVELOP A ROVER GROUP QUALITY STRATEGY FROM 1996 TO 2000	6% RETURN ON SALES	●	●	●	●	POLICY DEPLOYMENT R P Harland

APPENDIX 4

QUALITY STRATEGY DEPLOYMENT

LAND ROVER VEHICLES - CRITICAL SUCCESS FACTORS

ROVER GROUP

LAND-ROVER ROVER

	CSF	PROCESS	1992 Q4	1993 Q1 Q2 Q3 Q4	1994	1995	OBJECTIVE	RELATED CSF'S 1	2	3	4	5	6	CHAMPIONS CSF	PROCESS
PRODUCT QUALITY	1	*NEW CAR BUYERS SURVEY*	QAT ESTABLISHED. CURRENT BUILD PREDICTION COMPLETED.	ESTABLISH CORRELATION WITH CSM/COMMONISE. DEVELOP PROCESS/COMMUNICATION PROPOSAL. ESTABLISH DEFENDER MEASUREMENT PLAN. ESTABLISH NON-PRODUCT ACTION PLAN. NCAR DATABASE ON-SITE. DEVELOP B.I.C. FEATURES LIST. IMPLEMENT PROCESS AND REVIEW/REFINE. CQTS FPV < 2.5 FULL OWNERSHIP ESTABLISHED WITHIN PRODUCT LINES.	REVIEW AND CONTINUOUS DEVELOPMENT OF PROCESS. NCRS/CQTS FREEDOM FROM FAULT > 9.		WORLD BIC.				●	○	J. BRAGG	P. SIMKIN
		3 YEAR COST OF OWNERSHIP	PUBLISH PROCESS ACTIONS REQUIRED BY MODEL LINES.	MODEL LINE TARGETS AND ACTUALS ESTABLISHED BY MODEL LINE USING PROCESS CURRENT AND FUTURE. SERVICE SUMMARY RELEASED BY B.I.C. Q.A.T. STARTS TO DEVELOP "OTHER FACTORS". FOR PROCESS OF ADVISING COST OF OWNERSHIP MOVEMENT IMPLEMENTED. REVIEW BY QAT PROCESS MODEL LINE ACHIEVEMENTS AND ISSUE CUTIQUE.	REVIEW ACHIEVEMENT AND PROCESS IMPROVEMENTS. TIME AND PARTS COST DOWN 20% FROM 92.		BEST IN CLASS. COST OF OWNERSHIP OVER 3 YEARS.				●	●	T. HASWELL	P. ARMEL
		RATES OF DETERIORATION	QAT ESTABLISHED. SCOPE AND BOUNDARIES. DEVELOP PROCESS.	DEVELOP TEST & VALIDATION PLAN TO FOCUS ON COMPONENT DETERIORATION. CARRY OUT PILOT EXERCISE ON A SELECTED VEHICLE SYSTEM. IDENTIFY DESIGN CHANGES TO ACHIEVE B.I.C. EXAMINE CORE DECISION PHILSOPHY. IDENTIFY TRAINING & COMMUNICATION NEEDS. IMPLEMENT TRAINING PROG. IDENTIFY MODEL LINE KEY STEPS 50A + NEW PROGRAMME. SET TARGETS FOR CURRENT VEHICLES. REVIEW PROCESS. APPLY PROCESS TO ALL NEW MODEL INTRODUCTIONS.	100% IMPROVED COSMETIC DURABILITY FOR KEY TRIM. REVIEW PROCESS. MEASURE SUCCESS.	MEASURE CUSTOMER REACTION. 25% IMPROVED 3 YEAR RESIDUAL VALUE.	WORLD BEST IN CLASS 1996.				●	○		P. STORRIE
PEOPLE	2	*INVOLVEMENT AND COMMITMENT*	25% OF EMPLOYEES ACTIVELY INVOLVED IN TEAM IMPROVEMENT. SUGGESTION SCHEME AT 150% PARTICIPATION LEVELS. ABSENCE LEVELS AT 6%	LAUNCH – "SELF IMPROVEMENT" GROUPS. – TWO WAY APPRAISAL. 48% OF EMPLOYEES ACTIVELY INVOLVED IN TEAM IMPROVEMENT ACTIVITIES. SUGGESTION SCHEME AT 400% PARTICIPATION LEVELS. ABSENCE LEVELS AT 3%.	55% OF EMPLOYEES ACTIVELY INVOLVED IN TEAM IMPROVEMENT ACTIVITIES. ONE IMPROVEMENT CONTRIBUTION PER EMPLOYEE PER MONTH.	70% OF EMPLOYEES ACTIVELY INVOLVED IN TEAM IMPROVEMENT ACTIVITIES. ONE IMPROVEMENT CONTRIBUTION PER EMPLOYEE PER WEEK.	BEST IN EUROPE 1994.	○				●		J. NEWELL	L. GRAINGER K. GUIGGAN S. JEYES S. CONWAY J. MURPHY G. SMITH C. CLARKE M. KEMP B. OWENS P. ADAMS D. HEATH A. CLARKE K. TIJAN C. FEHTAM S. LANE S. DOUGLAS S. BROCKWELL
		DELEVOPMENT	COACHING QAT FORMED. P.D.F. USAGE AT 25%.	LAUNCH – "TOTAL QUALITY COACH" – "BUSINESS AWARENESS PROGRAMME". P.D.F. USAGE AT 50%. PILOT R & CD PANELS FOR ALL. RE-LAUNCH P.D.F.	P.D.F. USAGE AT 75%.	EVERY LRV ASSOCIATE TO HAVE A DEVELOPMENT PLAN.	BEST IN WORLD 1996.					○	G. WARD	
CUSTOMER DELIVERY REQ.	3	*DELIVERY TO PROMISE*	BATCH CONTROL PROCESS MEASURE ESTABLISHED.	NEW SUPPLIER DELIVERY MEASURE IMPLEMENTED. TDS/COLLECTION SERVICE ACROSS 90 SUPPLIERS. TDS/COLLECTION SERVICE ACROSS 240 SUPPLIERS. 97% ON TIME 100% + 1 WEEK.	98% ON TIME, 100% + 2 DAYS. RELIABLE DELIVERY PROMISE DATE TO CUSTOMER.		ORDER TO KEY HANDOVER CAPABILITY IN 14 DAYS.				○	●	●	P. BRECKON	L. McCRACKEN M. RICHARDS G. TAYLOR B. PRICE T. DONOVAN G. WILLIAMS
		FLEXIBLE RESPONSE TO REQUIREMENT	MIX BUY-OFF PROCESS ESTABLISHED.	PIPELINE IMPLEMENTATION PLAN PUBLISHED JIT/DE AND PIPELINE ACTION/IMPLEMENT TEAMS ESTABLISHED. F' TIMES MEASURED ON 'A' + 'B' PARTS 1500. 2500 END OF YEAR. PIPELINE SLOT SPEC. PROCESS AND ALLOCATION PROCESS AVAILABLE.	PIPELINE PROCESS ACROSS ALL PRODUCTS. F'TIME < 6 DAYS ON 98% PARTS.	2 WEEK ORDER CAPABILITY ON STANDARD ORDERS. F' TIMES < DELIVERY TIME ON 98% PARTS.	ELIMINATE NEED FOR FORECASTING.				●		●		
		CUSTOMER PERCEPTION		REVISED CSR SURVEY STARTS IN UK. ANALYSIS OF CSR RESULTS AND ACTION PLANS DEVELOPED.	CSR PROCESS TARGETTED FOR EUROPE.			●			○				
PRODUCT DEVELOPMENT	4	*TIMING*	COLLATE ROVER BEST DATA AND REVIEW AGAINST HONDA MODEL.	JOIN WITH GROUP BENCHMARKING EXERCISE TO ESTABLISH A CONSISTENT PROCESS. FINALISE BENCHMARKING DATA AND REVIEW AGAINST ROVER BEST. ESTABLISH FORWARD VEHICLE PROGRAMME AS ROVER BEST.	ESTABLISH NEW BEST PRACTICE IN COMMON APPROACH FOR ROVER GROUP.	CONTINUOUS 6 MONTH ROLLING REVIEW.	1993-ROVER BEST 1996-INDUSTRY BEST IN CLASS		○	●			○	R. ELSY J. HALL	R. CHARLTON M. ROWELL A. HENWOOD D. MANNAN B. WEBB K. PLANT
		Q & R PLANNING	DEVELOP CONSISTENT LRV APPROACH TO PLANNING. COMPLETE P.A.L.E.C.A. TRAINING.	COMMENCE EXTERNAL BENCHMARKING. DEVELOP ROVER BEST APPROACH. COMPLETE EXTERNAL BENCHMARKING. ANALYSE AND COLLATE RESULTS. APPLY ROVER BEST TO FORWARD PROGRAMME.	DEVELOP AND IMPLEMENT NEW BEST PRACTICE IN COMMON BUSINESS ENVIRONMENT ACROSS ROVER GROUP.	CONTINUOUS REVIEW THROUGH INTERNAL AND EXTERNAL BENCHMARKING.	ACHIEVE CSF 1 OBJECTIVES. TO BE INDUSTRY B.I.C. FOR Q & R PLANNING IN 1996.	●	○			●	○		
		BUSINESS EFFECTIVENESS	EFFECTIVE COST MANAGEMENT ESTABLISHED ON NEW PROGRAMMES. ESTABLISH MODEL LINE PROFITABILITY. ESTABLISH COMMERCIAL REVIEW FORUM.	DEVELOP FIRST PASS CORPORATE PLAN TO 2000. DEVELOP AFFORDABLE CAPITAL PROFILE. ESTABLISH E.C.N. ON CURRENT PROGRAMMES. DEVELOP AND IMPLEMENT EFFECTIVE SPENDING GUIDELINES. ROBUST CORPORATE PLAN ESTABLISHED TO 2000. 5 YEAR ROLLING REVIEW ESTABLISHED.	CONTINUED INTERACTIVE PLAN DEVELOPMENT.		ACHIEVE PLAN TARGET B.O.S. FOR LRV. ROBUST BUSINESS PLAN AND PROCESS ON 10 YEAR HORIZON.	○	○	●		●	●		
MANUFACT'G	5	*BUILD QUALITY*	RE-ALIGN ORGANISATION TO IMPROVE FOCUS.	ENGINEERING CHANGE & CONTROL. PHASE 2 TQI. ENHANCED PROCESS INSTRUCTIONS. DEFENDER 50 MEAN / 50 RANGE DISCOVERY 40 MEAN / 50 RANGE R/ROVER 50 MEAN / 50 RANGE	IMPLEMENT F.P.V. AUDIT MEASURES.		WORLD B.I.C. 1996.	●	○		○			I. COLLIER J. MILLETT	
		MANUFACT'G PROCESS	FOCUS ON CONTROLLED MATERIAL MANAGEMENT. DEVELOP PLAN FOR RFT BUILD OF MIX.	R.F.T. INC SHORTAGES > 70%. IMPLEMENT MIX MANAGEMENT PLAN. 95% OF ASSESSMENT FULLY FLEXIBLE. ACHIEVE AIS LEVEL 4.5%.	OPERATE A CONTINUOUS IMPROVEMENT PROCESS.		WORLD B.I.C. 1996.	○	○	●	●		●		
		ASSET UTILISATION	IMPLEMENT FACILITY AVAILABILITY MEASUREMENT AND ESTABLISH ACTION PLAN. DEVELOP SITE STRATEGY PROPOSALS.	TPM 1-4 IMPLEMENTED. SITE STRATEGY COMPLETE. PILOT MULTI SKILL MAINTENANCE.	ACHIEVE NEW 75 TURNS LOGISTICS ENVIRONMENT. PROGRESSIVE ACHIEVEMENT OF AUTONOMOUS MAINTENANCE STEPS 5-7.		WORLD CLASS CAPABILITY BY 1996.		●		○		●		
FLEXIBILITY	6	*STANDARD HOURS*	MEASUREMENT NOW DEVELOPED.	TARGET TO BE SET. 10% IMPROVEMENT TO BE IMPLEMENTED.	10%	10%			●	○	●	●		T.K. MORGAN	G. JOHNSON B. SULLIVAN
		MODELS PER FACILITY	SITE STRATEGY FIN CAP 1 ISSUED.	RANGE ROVER MOVE. NEW PROGRAMME STRATEGY.	MAINTAIN 4 MODEL LINES CAPABILITY.	DEMONSTRATE 5 MODEL CAPABILITY.			○	○	●	●			
		ON-TIME DISTRIBUTION	UK DISTRIBUTION IN 3 DAYS EX PLANT.	EUROPEAN DEPOT ESTABLISHED STOCK REDUCTION PLANNED	ENHANCED I.T. COMMUNICATIONS WITH DEALERS IN PLACE.	DISTRIBUTION IN EUROPE WITHIN 1 WEEK EX PLANT				●					
		PBIT PER MODEL	MODEL LINE PROFITABILITY DEVELOPED.	TARGETS TO BE DEVELOPED. ROLLING BUDGET.	ACHIEVE TARGET MINIMUM B.O.S. ON ALL MODELS AND TARGET MINIMUM FOR LAND ROVER VEHICLES.	IMPROVE B.O.S. BY 1%	ACHIEVE 50A PBIT TARGETS.	○			●				

DATE: JANUARY 1993 ISSUE NUMBER: 1 AUTHORISED BY: Terry Morgan

TERRY MORGAN
MANAGING DIRECTOR LAND ROVER VEHICLES

● STRONG LINK ○ RELATED

Issue 3 - September 1994

PROJECT MANAGEMENT PROCESS GROUP 1994 BUSINESS PLANS

Traffic Light Key - □ = On Target Or Complete △ = Behind Schedule ○ = Yet To Commence Or Halted

ROVER CRITICAL PROCESSES	Project Management Process Group Key Processes	QUARTER 1 1994	STATUS	QUARTER 2 1994	STATUS	QUARTER 3 1994	STATUS	QUARTER 4 1994	STATUS	GDE CSFs: Create a total working environment to harness the skills and talents of all our people	GDE CSFs: Change and improve our skills to meet the needs of the business	GDE CSFs: Monitor perception of Quality from being faults to delivering what our customers value	GDE CSFs: Get Rover behind a 15 year Strategy which works	GDE CSFs: Implement the new product introduction process	GDE CSFs: Build on management vision to create and deliver world leading products programmes & technologies	GDE CSFs: Take confidence in the various corners of exam	OWNER
New Product Introduction	Reliability Specification and Test Process	Review draft issue feedback for issue one Publish issue 1 of Spec & Test process Develop implementation plan for B U / Project teams Develop cascade material	□□□	Continue to develop/review cascade material Cascade Spec & TEst to B U / Project teams ref implementation plan	□□	Continue cascade of Spec & Test to B U & Project teams ref implementation plan Support project team cascade Support use of Spec & Test in project teams	□△△	Review cascade process and material Review use of Spec & Test Continue cascades Develop 1995 plan and milestones	□□□	○	●	●		●	○	●	DH
	Project Management Policy	Review current status Refine database & documentation Define development areas within Company	□□□	Continue cascade of policy (issue 3) Benchmark best practice Review issue 3.0 in line with best practice	□□□	Issue revisions Cascade material as appropriate	□△	Develop 1995 plan Continue appropriate cascades	△△	●	○	○	○	●	○	●	AH
	Reliability Management Process	Review current status Refine database & documentation	□□	Cascade of policy via selected project teams Re-issue procedure PS/QE/034	□□	Review issue 1 in Line with Best Practice Throughout the Business	△	Issue revised version RMP issue 2 Develop 1995 plan	○□	○		●	○	●		○	TS
	Design Methodology	Issue procedure Review cascade status Review CAD system applicability	□□□	Review procedure Support cascade Project team cascade to TL level complete Measures developed Develop CAD approach & pilot (ies)	○□△□	Develop strategy for one RO approach Support HyOS project (OFD & FMECA IT system)	□□	Implement strategy Implement CAD approach	○○			●		●	●	○	AC
	Environmental Management Process			Develop cascade material Publish issue 1 Review feedback	□□□	Review and develop material Facilitate implementation with project teams Review progress with project teams	□□□	Develop material for issue 2 Develop cascade plan	□□	○	●	●		●	○	○	DG
	Q&R Self Assessment Process	Publish 1994 schedule SWOT profile of 1993 review process Develop process based on RO self assessment process	□□□	Pilot revised process	□	Publish measures against 8 Q&R presumptives Agree improvement plans	□□	Review strengths and weaknesses in 1994 process Agree 1995 schedule	△△		○	●		●		●	PV
	Rover Project Management System Development	N/A		N/A		N/A											AH
	JIT/DE in Engineering	N/A		N/A		Appoint Champion for Engineering Review Key Issues & Develop Project Plan	□△	Establish JIT/DE Implementation Process Form JIT/DE Engineering Team Agree AOS JIT/DE Co-ordinators	△△△	●	●			●	○	●	CT/ PV
	Total Cost Management			Appoint person with right skills Review current application	□□	Capture improvement ideas	□	Issue Draft ETCM	□	●	○	○		●	○	●	JM
Corporate Learning	Supplier Culture	Analyse questionnaire feedback Prioritise improvement actions Address key concerns - communication Implement other improvement plans	□□□	Continue improvement actions Measure satisfaction ratings Identify two change agents for each focused learning package	□□□	Continue improvement actions Measure satisfaction ratings Develop and issue updated questionnaire	△△○	Analyse questionnaire feedback Prioritise improvement actions Address key concerns Implement other improvement plans	○○○	○	○	●	○				DG
	Quality Policy Deployment	Agree ownership of Forward Programmes procedures Agree common format for ER&T handbooks Develop draft internal handbook review schedule Add Quality Policy ref to lead procedures	□□□	Agree new ownership of procedures where required ER&T handbooks in common format	□□	Identify new handbook owners arising from reorganisation Ensure all areas have current handbook	□△	Internal audit of handbook All R&T handbooks in common format	□□	●	●	●	●	●	●	●	DG
Management of People	Rover Tomorrow	Review content of checklist Develop skills profiles	□□	Review team against skills profile Identify skills gaps Skill gap closure plans in PDPs	□□	Reliability champions review skills vs profile Identify skills gaps	○○	Review skills profiles	△	●	●	○		○			DH
	Involvement of Reliability Champions	Convene Q&R champion workshop	□	Update Q&R champions skills profile Involve QE & WHQ personnel in closing skills gap	△○	Convene Q&R champion workshop Have plan for closing skills gap	○○	Q&R champions able to lead and facilitate training on FMECA & process capability	△	●	●	●		●	○	○	PV
	Project Managers Development	N/A		N/A		Identify Project Team Requirements Develop Project Manager Skill Profile	□△	Identify Best Practice in Project Teams Establish Resource Management Process Review Skill Base Against Profile	○□○	○	●	○	○	●	○	○	JC
Business *Planning*	Business Plan	Publish 1994 plan and agree detailed actions	□	Business plan measurement process developed Objectives and measures defined in PDPs	□□	Review 1994 plan and measures	□	Develop 1995 plan	□	●	●	○		●	○	○	CT

APPENDIX 5

QUALITY STRATEGY REVIEW

QUALITY STRATEGY REVIEW Q1 1994 - New Product & Product Improvement Milestones

	MILESTONE	RG Overall	Limits	SMC	LC	LRV	RGPT	RBP	ISSUES / ACTIONS
	New Product Introduction								
93	World class training & application of Q&R techniques	⌀	O<50%⌀ ⌀<25%●	⌀	O	⌀	O		Revised BIW process capability guidelines. Delayed pending Honda learning review (SMC).
94	70% engineering change identified before D1 - all programmes	O	O<50%⌀ ⌀<25%●	O	O	⌀	O	O	P 38A - all new vehicle. True performance only known retrospectively.
94	All parts to production standard at QP	⌀	O<50%⌀ ⌀<25%●	⌀	O	⌀	●	O	Cost of parts at planned cycle times at QP. Measures to be developed Q2 '94 (RGPT)
94	Product complexity equal to benchmark competitor	⌀	O<50%⌀ ⌀<25%●	⌀	⌀	O	O		Rover 800 - target Vs declining volumes 4x4 benchmark to be developed
94	Effective cost management applied to all new programmes	O	O<50%⌀ ⌀<25%●	O	⌀	O	O	O	Quotation Analysis Forms in place of Cost Detail Tracking Sheets for LC current models
94	All project teams can demonstrate compliance with the 6 Q&R prescriptives	O	O<50%⌀ ⌀<25%●	⌀	⌀	O	O	O	New process capability guidelines to be cascaded. Measure of application of project management techniques at a component level to be further developed.
95	World best in class Q&R in each product sector	●	O<50%⌀ ⌀<25%●	⌀	●	⌀	⌀		Powertrain performance Rover 800, Disco, Range Rover
	Product Improvement								
93	Reduce time from problem recognition to solution by 20%	⌀	O<50%⌀ ⌀<25%●	O	⌀	O	⌀		Measures linked to priority to be developed (RGPT)
94	Double speed of change process - release to implementation	O	O<50%⌀ ⌀<25%●	O	⌀	O	O	⌀	Definition of 'implementation' to be clarified
94	World class problem ownership & solving - mfg team leaders	⌀	O<50%⌀ ⌀<25%●	⌀		O	⌀	O	Focus to align problem ownership with business objectives (RGPT)

RM:\qsreview\94newprd.doc

APPENDIX 6

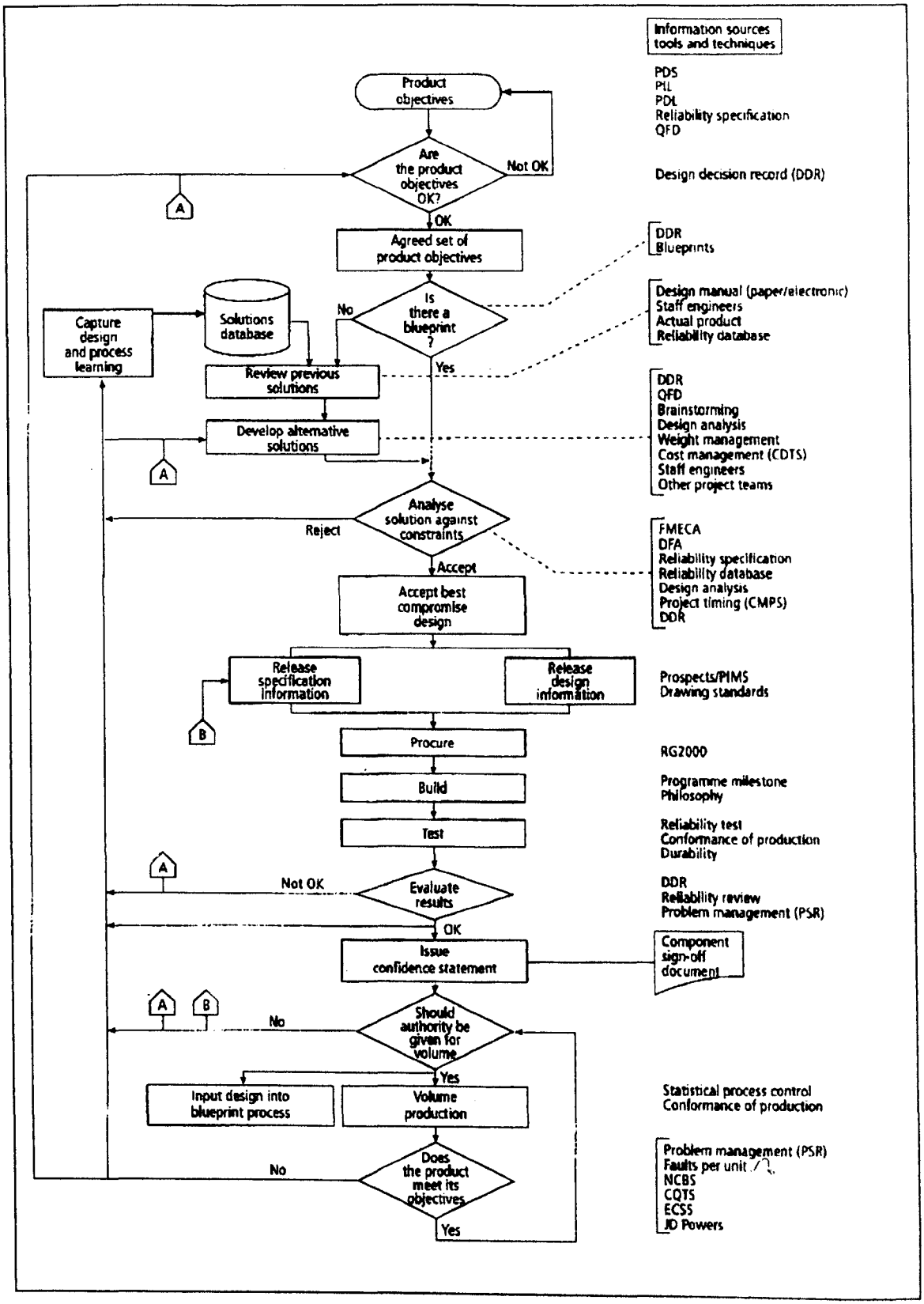
PMP SUCCESS CRITERIA

SUCCESS CRITERIA D02 (DL3) → D 1 (VB1)	
VEHICLE AESTHETICS	All components of Production intent tools.
PRODUCT 'MARKET' DESCRIPTION	D02(DL3) phase completed S & A class PSR'S included in D1 build phase. Vehicles build to agreed features list. Validation testing completed to Plan. Updated reliability profile, specifically design/component and system, FMECA'S.
PRODUCT 'PROCESS & MANUFACTURING DESCRIPTION'	ALL D1(VB1) vehicle/Power units build by manufacturing. ALL Production intent parts off production intent tools. ALL manufacturing processes/facilities/training of teams in place. Complex Quality Plan started. Parts sourced from Production system. Reliability critical items:- all actions completed. Actions agreed for logistics, expansion on total material flow. Complex quality fixtures available. I.Q.S. target of 300 points achieved
PRODUCT INVESTMENT -INCL VENDOR TOOLING	Review of spend profile against (Red Book), including any mandatory changes.
PRODUCT VARIABLE COSTS	Continue Cost Management Process to achieve or better agreed cost target.
PROGRAMME COSTS	Review of spend against Programme costs, in line with Programme Objectives. Review Manufacturing launch costs. Marketing launch costs. Product development costs. Outsourced costs. Agreed fixed costs (base).
VOLUME & PRICES	Status and Sensitivity report in line with Programme Objectives. Variable marketing costs. Gross to net Revenue.
PROFIT	Status review concurrance against financial paper. Contributions/Margins R.O.A.E. P.B.I.T. I.R.R. R.O.S. Cash Flow Sensitivity Analysis
PROGRAMME RESOURCES	Total Resource profile agreed. Review resource profile and skills profile up to launch. Review outsourcing. Review Facility plans. Review resource budget against target.
PROGRAMME TIMING	Delivery Timing plan - on time. Plans in place for next build phase, and agreed.
EVENT	D1 Event held - confidence to move forward. Action plans in place for any concern area's.

APPENDIX 7

ROVER DESIGN METHODOLOGY

ROVER DESIGN METHODOLOGY FLOWCHART



APPENDIX 8

RELIABILITY MANAGEMENT PROCESS

RELIABILITY MANAGEMENT AND CONTROL DOCUMENT (RMCD)

	ACTIVITY / BUILD PHASE	ACTIVITY OWNER	CONCEPT	D – ZERO	D – ZERO EVENT	DO 2	D1/1	D1/2	QUALITY PROVING	MATURATION OF BUILD	VOLUME + 90 DAYS
1	RELIABILITY CO-ORDINATOR APPOINTED		X								
2	RELIABILITY WORKSHOP / PLANNING / REVIEWS		W X X	X X	X	X	X	X	X	X	•
3	AGREE PROJECT MEASURES & PERFORMANCE CRITERIA		X		X	X	X	X	X	X	•
4	ESTABLISH BENCHMARK & RELIABILITY TARGETS		X		X			X			•
5	FEATURES FREEZE		X		X						
6	INITIATE PDS		X		X						
7	RELIABILITY PREDICTIONS		X	X	X		X	X	X	X	•
8	FOCUSSED RELIABILITY TRAINING PLAN		X	X	X	X					
9A	ESTABLISH COMPONENT / SUPPLIER TEST PLANS		G	X	X	X	X	X	•		
9B	ESTABLISH VEHICLE TEST PLAN		G	X	X	X	X	X	•		
10	SUPPLIER NOMINATION AND CONTROL		X	G	X						
11	REL CRITICAL ITEMS & REL CRITICAL PROCESSES LIST		D P		X		X	X	X		
12	FMECA PLAN INTERNAL AND SUPPLIERS (D&P)		X		X	X	X	X	*D	*P	
13	INITIATE / UPDATE PROBLEM MANAGEMENT SYSTEM		X	X	X	X	X	X	X		•
14	INITIATE FMECA'S		D P			X	X	X	X	X	•
15	DEVELOP & INITIATE DESIGN FOR ASSEMBLY (DFA) PLAN		X		X	X	X	X	X	X	•
16	FIT & FINISH / COMPLEX QUALITY PLAN		X		X		X	X	X	X	•
17	BODY OF QUALITY		X		X		X	X	X	X	•
18	CRITICAL ACTIONS REPORT (CAR)		X	X	X	X	X	X	X		•
19	CONFORMITY OF PRODUCTION TEST PLAN (INTERNAL & SUPPLIERS)		G	X	X	X	X	X	X	•	
20	QUALITY ASSESMENT PLAN & IMPLEMENTATION		X	X	X	X	X	X	X	X	•
21	PLAN BUILD GEBA'S		X		X	G	G	G	G	G	
22	PRODUCTION ASSOCIATE TRAINING PLAN			X	X		X	X	X	•	
23	INITIATE TPAS			X	X						
24	INITIATE PROCESS CAPABILITY STUDIES						X	X	X X		•
25A	PROJECT / PRODUCT DESIGN SIGN-OFF						X	X •			
25B	PROJECT / PRODUCT SUPPLY SIGN-OFF								X	X •	

X - INITIATE ACTIVITY & REVIEW(S) W - WORKSHOP G - GEBA P - PROCESS D - DESIGN

• - ACTIVITY COMPLETED AND DOCUMENTATION READY FOR HAND OVER TO CURRENT PRODUCT TEAM

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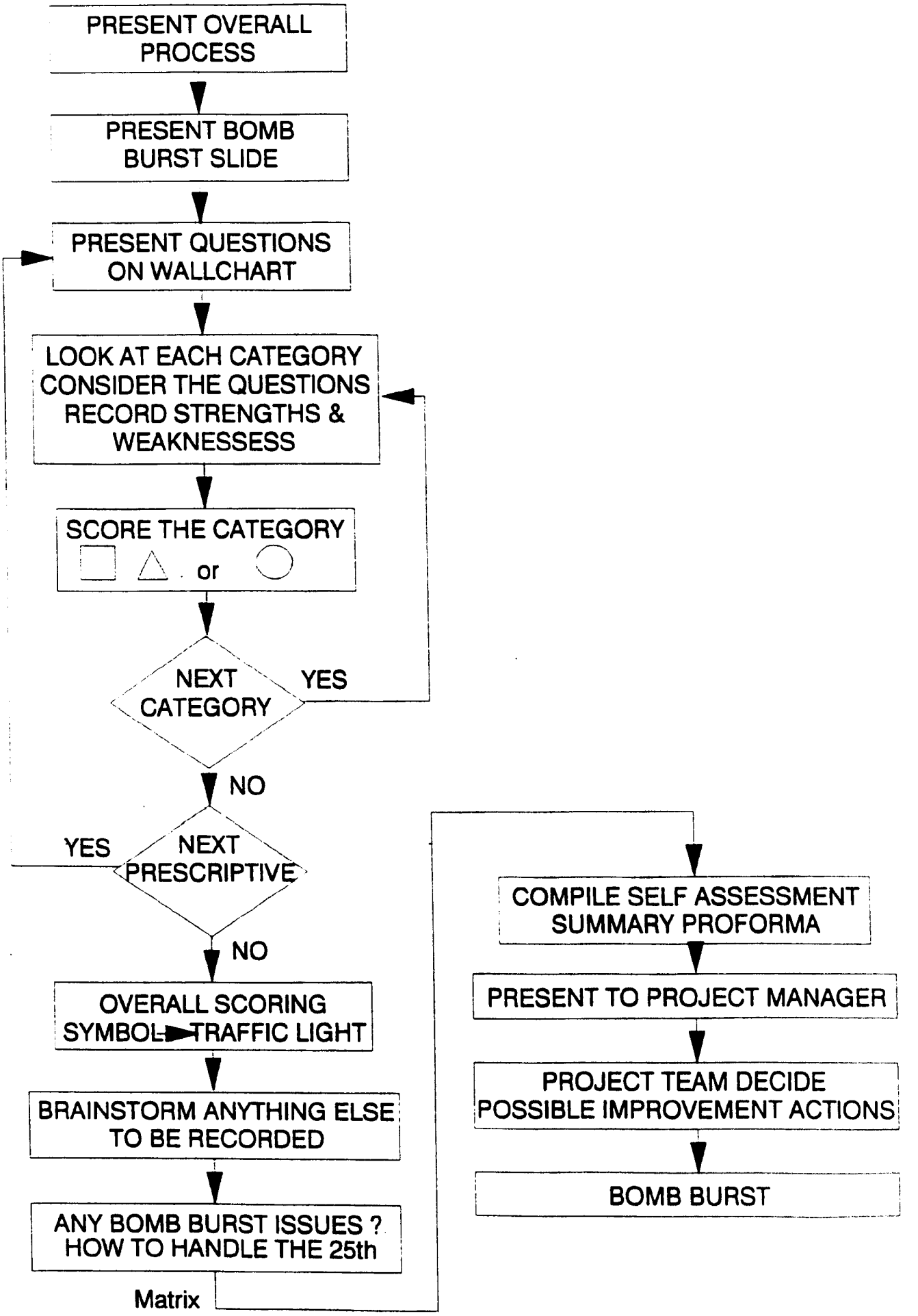
APPENDIX 9

PROJECT TEAM SELF-ASSESSMENT PROCESS

SELF ASSESSMENT REVIEW PROCESS



Q & R Review Process

Project Management Policy (PMP)

Process in place

(Foundation)

Has PMP been cascaded to your team?

Do people understand the role PMP plays to help deliver the project ?

Was the focused learning package used to perform the cascade ?

Actions

(Deployment)

Are you doing the Q & R activities ?

Are the milestones in place ?

Have the success criteria been reviewed ?

Have you developed action plans to address any shortfalls ?

Do all actions have agreed owners ?

Have you got risk management documented ?

Are you holding regular Q & R reviews ?

Do you have a plan to reduce / eliminate risk?

Revisiting & questioning the Process

Have you revisited the application of PMP in the project team ?

Have you fed back any comments or improvements to the Q&R Process Group?

Have you passed on your learning to other projects / teams ?

Are you doing things differently as a result of PMP introduction ?

Have you involved other teams in improving your approach to project management ?

Results

Have 75% of the team received the cascade ?

Were 75% of the success criteria achieved in the last phase ?

Are 75% of the success criteria planned for this phase ?

Are all of the deviations from PMP fully documented ?

APPENDIX 10

FOCUSED LEARNING APPROACH

Q & R FOCUSSED LEARNING
IMPLEMENTATION PROCESS