Sustainable Improvement Processes for 21\textsuperscript{st} Century Manufacturing Enterprises

Thesis

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PhD: MANUFACTURING: MANAGEMENT AND TECHNOLOGY

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Sustainable Improvement Processes for 21st Century Manufacturing Enterprises

April 2006
Title Page

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Sustainable Improvement Processes for 21st Century Manufacturing Enterprises

PhD: Manufacturing: management and technology

April 2006
Statement of Original Authorship

I, Alun Batley, confirm that:

I am the original author of this research thesis and that the research needed to produce this work was undertaken solely by me.

this work has not been published previously nor has been used towards the award of any degree or any qualification of the Open University or any other degree awarding body.

Signed: Alun Batley

Date: 15th April 2006
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5 Discussion and Conclusions</td>
<td>255</td>
</tr>
<tr>
<td>6.6 Further Work</td>
<td>268</td>
</tr>
<tr>
<td>6.7 Summary</td>
<td>269</td>
</tr>
</tbody>
</table>

**CHAPTER 7: DISCUSSION AND CONCLUSIONS**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Introduction</td>
<td>270</td>
</tr>
<tr>
<td>7.2 Conclusions Regarding each Research Question</td>
<td>272</td>
</tr>
<tr>
<td>7.3 Limitations</td>
<td>279</td>
</tr>
<tr>
<td>7.4 Further Work</td>
<td>281</td>
</tr>
<tr>
<td>7.5 Summary of Conclusions</td>
<td>282</td>
</tr>
</tbody>
</table>

REFERENCES

BIBLIOGRAPHY

APPENDICES
**TABLES**

Table 1: Summary of Research Process 7
Table 2: TQM Sustaining Categories and Issues 30
Table 3: Assumptions of the Operator Culture 35
Table 4: Assumptions of the Engineering Culture 35
Table 5: Assumptions of the Executive Culture 36
Table 6: Eight Steps for Business Transformation 53
Table 7: A Framework for Sustainable Development 59
Table 8: Reactive Change Paths 70
Table 9: Creating Proactive Change 72
Table 10: Matching Research Questions with Strategy 88
Table 11: Strengths of Data Collection Methods 90
Table 12: Weaknesses of Data Collection Methods 93
Table 13: Summary of Methodologies 102
Table 14: Comparison of Key Data from Survey 115
Table 15: The Success and Popularity of Individual Initiatives 116
Table 16: Initiatives Currently Ongoing – Top Four Highest % Age Score 117
Table 17: Sector Split At Bosch 128
Table 18: Measures of Performance – Bosch 132
Table 19: Question 7, pre-set goals 133
Table 20: Question 8, pre-set changes 134
Table 21: Performance measures used on the TPM initiative 136
Table 22: Additional Goals set for the TPM Initiative 137
Table 23: Further changes from the TPM initiative 138
Table 24: Performance Measures Associated with the SPC Initiative 145
Table 25: Measures of Performance – Tenneco 148
Table 26: Measures for Product 1: RIA Assembly 157
Table 27: Measures for Product 2: Eci Vitros Reagant Pack Assembly 157
Table 28: Summary of Responses to Question 7 and Question 8 160
Table 29: Summary of Responses, Main Objectives, Measures and Investment 161
Table 30: Summary of Responses, Initiative Introduction, Re-launch and Success 162
Table 31: Summary of Responses: Further Comments 163
Table 32: Overview of Model Stages and Outcomes 180
Table 33: Identifying the Hows, Examples of Initiatives That Might Help 187
Table 34: Identifying Performance Measures, Some Examples and Possible Top Level Measures 188
Table 35: Culture Analysis Process 193
Table 36: Initiative Measurement Process 203
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A taxonomy of approaches to change</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Performance Improvement</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>Taxonomy of Improvements</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>Operational Change / Strategy Gap</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Market Trends</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>A Model for Organisational Change</td>
<td>28</td>
</tr>
<tr>
<td>7</td>
<td>Levels of Strategy</td>
<td>39</td>
</tr>
<tr>
<td>8</td>
<td>Approach Used to Develop the Research Aim and Questions</td>
<td>43</td>
</tr>
<tr>
<td>9</td>
<td>The Search for Improvement</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>Basic Stages of the Intervention Model</td>
<td>60</td>
</tr>
<tr>
<td>11</td>
<td>Change Path Diagnostic</td>
<td>69</td>
</tr>
<tr>
<td>12</td>
<td>Process and Output Performance Measures</td>
<td>79</td>
</tr>
<tr>
<td>13</td>
<td>Approach used to Investigate Research Questions and Aim</td>
<td>84</td>
</tr>
<tr>
<td>14</td>
<td>Relationship between Strategy and Tactics</td>
<td>86</td>
</tr>
<tr>
<td>15</td>
<td>A Framework for the Case-Study Research</td>
<td>95</td>
</tr>
<tr>
<td>16</td>
<td>Survey of Automotive Companies Process</td>
<td>105</td>
</tr>
<tr>
<td>17</td>
<td>Roles of Respondents</td>
<td>111</td>
</tr>
<tr>
<td>18</td>
<td>Company Size – Employees</td>
<td>112</td>
</tr>
<tr>
<td>19</td>
<td>Values Attributed To Initiatives</td>
<td>113</td>
</tr>
<tr>
<td>20</td>
<td>Initiatives Attempted Per Company</td>
<td>114</td>
</tr>
<tr>
<td>21</td>
<td>Initiatives Attempted Against Average Score</td>
<td>115</td>
</tr>
<tr>
<td>22</td>
<td>Sustainability – Success Systems Diagram</td>
<td>120</td>
</tr>
<tr>
<td>23</td>
<td>Bosch Alternator Assembly Process</td>
<td>129</td>
</tr>
<tr>
<td>24</td>
<td>The KAIZEN Umbrella</td>
<td>150</td>
</tr>
<tr>
<td>25</td>
<td>Proposed Disconnect Process</td>
<td>154</td>
</tr>
<tr>
<td>26</td>
<td>Grid Illustrating Successful Against Sustained Initiatives</td>
<td>164</td>
</tr>
<tr>
<td>27</td>
<td>Overview of the model application process</td>
<td>178</td>
</tr>
<tr>
<td>28</td>
<td>Flow Chart of Model</td>
<td>181</td>
</tr>
<tr>
<td>29</td>
<td>Change / Culture Change Relationship</td>
<td>192</td>
</tr>
<tr>
<td>30</td>
<td>The Survival Curve – Mismatch</td>
<td>199</td>
</tr>
<tr>
<td>31</td>
<td>Achievement of Goals and Other Factors</td>
<td>201</td>
</tr>
<tr>
<td>32</td>
<td>The Experiments</td>
<td>206</td>
</tr>
<tr>
<td>33</td>
<td>Management Structure Service Centre CPE</td>
<td>244</td>
</tr>
<tr>
<td>34</td>
<td>Grid used to define the type of improvement</td>
<td>259</td>
</tr>
<tr>
<td>35</td>
<td>Modified Grid used to define the type of improvement</td>
<td>259</td>
</tr>
<tr>
<td>36</td>
<td>Revised Survival Curve</td>
<td>262</td>
</tr>
<tr>
<td>37</td>
<td>Revised model flow chart</td>
<td>263</td>
</tr>
<tr>
<td>38</td>
<td>Degree of Support and Urgency Graphs</td>
<td>Appendix 7</td>
</tr>
<tr>
<td>39</td>
<td>Degree of Support and Urgency Graphs - Modified</td>
<td>Appendix 15</td>
</tr>
<tr>
<td>40</td>
<td>Rationalisation of Table 41 &amp; Figure 3</td>
<td>Appendix 15</td>
</tr>
</tbody>
</table>
APPENDICES

Appendix 1: Covering Letter Sent To Surveyed Companies
Appendix 2: Survey of Successful and Unsuccessful Improvement Initiatives
Appendix 3: Example of a Completed Survey Questionnaire
Appendix 4: Survey Results – Raw Data
Appendix 5: Structured Interview Questionnaire
Appendix 6: Example of a Completed Structured Interview Questionnaire
Appendix 7: Model Worksheets
Appendix 8: Background Data for Initiatives & Performance Measures
Appendix 9: Key Contributions towards the Development of the Model
Appendix 10: Experiment 1 – Further Information
Appendix 11: Experiment 2 – Further Information
Appendix 12: Experiment 3 – Further Information
Appendix 13: Nominal Group Technique
Appendix 14: Brainstorming
Appendix 15: Examples of Potential Improvements
GLOSSARY OF TERMS

Just-In-Time (JIT):
In the broad sense, an approach to achieving excellence in a manufacturing company based on the continuing elimination of waste (waste being considered as those things, which do not add value to the product). In the narrow sense, just-in-time refers to the movement of material at the necessary place at the necessary time. The implication is that each operation is closely synchronised with the subsequent ones to make that possible.

Total Quality Management (TQM):
Total Quality Management refers to company-wide programs to empower workers and managers to solve problems scientifically with an eye to improving customer satisfaction. Driven by a strong customer-focused mission, all personnel in a TQM environment pursue a well-defined improvement process, such as the highly publicised strategies articulated by Motorola and Xerox. TQM should be seen as a people-oriented way of running a business, not just another way to achieve better results by pursuing business as usual.

Agile Manufacturing:
Agile manufacturing is the result of a convergence of all of the advanced manufacturing programmes. It represents unification of service, quality, flexibility and cost.

Benchmarking:
Benchmarking is the search for industry best practices that lead to superior performance. It is a new way to establish operating targets based on the best of the best practices, constantly reviewed and updated to ensure the best and most structured way to obtain long term superiority.

Gedunken Experiments:
Experiments which are not carried out in reality, but are undertaken as mental exercises. Regarded as one of the most powerful tools used in physics.
Source: Goldratt, Eliyahu M. (1990)

Work in Process (WIP):
Partly finished goods, services or contracts, which are in the process of manufacture or completion.

Statistical Process Control (SPC):
The approach of Statistical Process Control is to measure the characteristics of both the product (dimensions, materials, etc.) and the process (heat inputs, machine speeds, etc.). The measurements are presented to give information about trends in the process. The information provides the basis for
action, which improves the processes, reduces scrap and prevents the production of items that do not meet customers' expectations (or the design intent). It is associated with the theme of controlling the process NOT the product and is a form of feed forward control.

**Poka Yoke**

Poka yoke, or mistake proofing, is about developing systems or processes that prevent mistakes being turned into defects. The basic philosophy behind poka yoke is to eliminate the opportunity for human error.

**Kaizen**

Kaizen means improvement. Moreover it means continuing improvement in personal life, home life, social life and working life. When applied to the workplace kaizen means continuing improvement involving everyone – managers and workers alike.

Source: Imai (1986)

**Theory of Constraints (TOC)**

A methodology for identifying and overcoming limitations within the organisation that restrict performance or the achievement of goals.

**Lean Manufacturing**

Lean manufacturing is characterised by a number of properties:

- Right first time
- Continuous improvement and quality inherent in any product or process
- Flexible production
- Minimising waste of any kind – time or material.

**Kanban**

Kanban is a method of “pulling” materials through a manufacturing process, and of doing so only when it is necessary. “Kanban” is in fact a loose translation of a Japanese word for a billboard or sign, and is now used to mean “visible signal”. It is commonly used synonymously for systems that use such tickets or signals or which operate in similar ways. There is thus no actual need for there to be a physical ticket; the emptying of a container of components can be just as effective a signal.

**Single Minute Exchange of Dies (SMED)**

Developed by Shigeo Shingo in 1970, the philosophy behind SMED is that any set up change-over should be completed in under 10 minutes i.e. a single minute. A change-over is defined as the time between the last good part of product 'A' to the first good part of product 'B'.

**5S**

5S is a system of steps and procedures that can be used by individuals and teams to arrange work areas in the most appropriate manner to optimise performance, comfort, safety and cleanliness. The
5Ss are Japanese terms as follows, Seiri, Seiton, Seiso, Seiketsu, Shitsuke which are usually translated as Sort, Set in order, Shine, Standardise and Sustain.

**Total Productive Maintenance (TPM)**
Total productive maintenance aims at maximising equipment effectiveness throughout the entire life of the equipment. TPM involves everyone in all departments and at all levels; it motivates people for plant maintenance through small group and voluntary activities, and involves such basic elements as developing a maintenance system, education in basic housekeeping, problem solving skills and activities to achieve zero breakdowns. Top management must design a system that recognises and rewards everyone's ability and responsibility for TPM.
Source: Imai (1986)

**Cellular Manufacturing**
Cellular manufacturing systems are designed to process part families in dedicated production areas, referred to as manufacturing cells.

**Taguchi – DOE**
Taguchi's approach to the design of experiments is based on statistical theory and is based upon representative sampling and the design of sufficient and appropriate experiments to test situations.

**Failure Mode and Effects Analysis (FMEA)**
Failure Modes and Effects Analysis (FMEA) is a powerful tool used to prevent failures in products and processes. FMEA provides a systematic method that harnesses the knowledge and experience of a team to identify, prioritise and eliminate all potential failures.

**Supplier Integration**
Supplier integration is about developing close working relationships with key suppliers in order to help them provide a better service. Now more commonly referred to as supply chain management or pipeline management.

**Quality Circles**
Quality circles are defined as voluntary meetings of peer groups to identify and resolve Quality problems in their immediate working area.
ACKNOWLEDGEMENTS

It is impossible to thank or even note all the people who have contributed in some way to my gaining in knowledge over the past thirty years to provide me with the confidence and persistence to complete this research.

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ABSTRACT

This research describes how a practical tool or model, that supports sustainable performance improvement in manufacturing organisations, was successfully developed. As there is no improvement without change then this research is also about change – organisational change. The justification for the research is based on the concept that many improvement initiatives fail to deliver the benefits that are claimed for them. Research undertaken in the automotive industry in Wales indicated that the organisations surveyed attempted an average of thirteen initiatives each. This surprising figure, added substance to the need for this research, to clarify the reasons for undertaking improvement initiatives and the necessity for a clear mechanism for the introduction, implementation and sustainability of the improvement process.

The literature indicated a number of essential factors that affect the success or failure of a change programme or the introduction of a new initiative. These factors were confirmed through six case studies based in three different organisations.

The research was primarily concerned with the process used to successfully introduce and sustain performance improvement and the challenge was to develop a practical tool that works rather than just be a search for knowledge. The information from the case studies and the literature reviews provided detailed information that enabled the model to be developed. Subsequently, the model was developed, and its functionality tested, using a company in south east Wales and through three field experiments in three separate organisations. A unique element of the model was the development of an Initiative Measurement Process (IMP) that can be used to evaluate the likely success of an improvement programme based on a number of factors being in place. Further work has been identified including refining the IMP and its scoring system, ongoing testing of the accuracy and validity of the culture questionnaire and using the model over a longer period in a manufacturing company possibly using internal facilitators.

This research adds to knowledge in that a practical tool that supports the implementation and sustainability of performance improvement initiatives through the consideration of a number of factors that will also significantly increase the likelihood of success has been developed and thoroughly tested.
Chapter 1
CHAPTER 1: INTRODUCTION

1.1 Background

Organisations in their quest to remain competitive often seek new initiatives to attempt to keep pace with change. Change, as it is usually orchestrated, can create initiative overload and organisational chaos and unfortunately many well intentioned and promising initiatives fail to deliver their anticipated results and they fade away and die. This research is concerned with sustainable improvement in the manufacturing industry where sustainable improvement is defined as improvement that is integrated into an organisation and is part of the normal way that business is conducted. The research is developed in the context of technology or technological in that it seeks to produce something practical and applied rather than just be a search for knowledge. This chapter introduces the study by providing an overview of the research undertaken.

Improvement is concerned with increasing competitiveness and many reports have been published commenting on the lack of competitiveness of British Industry compared with other countries - typically America, Japan and Germany. The Department of Trade and Industry (DTI) have released a number of useful publications and encouraged research into the issues that affect the competitiveness of industry – especially manufacturing. The 'Managing into the Nineties' range of booklets, published as part of the Enterprise Initiative in the early 1990s, provided an interesting and useful perspective on the types of initiatives that may be used to increase the effectiveness of a manufacturing plant. But, even after ten to fifteen years of effort one of the DTI's most recent reports is titled 'UK Manufacturing: We can make it better'. The report discusses the future of manufacturing and what it could look like in the year 2020. The panel involved in the 2020 project were asked to respond to six objectives linked to improving manufacturing companies in the UK. The four conclusions reached were:

- Manufacturing will remain of major importance to the UK economy
- Manufacturing is changing – and redefining itself as a provider of lifetime service around a manufactured product.
- The internet is a major enabler and will initiate a paradigm shift.
Much remains to be done to secure the UK’s position in what will be a European manufacturing ‘competition’ – but the UK can succeed.

(DTI Report 2000:3)

Thus, manufacturing is still recognised as being of significance to the UK economy but major change and improvement are regarded as imperative. Finally the most important issue is identified as:

Putting the recommendations into action, not just nationally but at every level of every company and individual involved in manufacturing.

(DTI Report 2000:3)

This research is about improvement – ‘making it better’ and sustainability – putting the improvements ‘into action’. Improvement focuses on two broad objectives, adding value for the customer and eliminating waste. The elimination or reduction of waste is a basic principle behind lean manufacturing initiatives where waste is defined as ‘anything that fails to add value’ and can be identified by asking the question ‘will the customer pay for this?’ Adding value for the customer and the need to reduce waste is driving manufacturers to become more flexible and responsive and the need to compete on factors such as service, reliability, quality and delivery time and to add customer and stakeholder value as well as reduce costs is paramount. These factors, plus the continuing importance of manufacturing to the UK economy and the need for change and improvement, provide justification for research into the most appropriate means of introducing and sustaining improvement initiatives. This research is both timely and relevant as it addresses the issues related to improvement and change by attempting to develop a process, or model, that will ensure that improvements are successfully implemented and also sustained.

1.2 Research Aim and Questions

Primarily this research is about the implementation, management and control of change through the development and testing of a practical tool or model which when applied will guide organisations towards sustainable improvement. The concept of sustainable
improvement is an important issue and the need to develop a sustainable improvement model is fundamental to the research.

Sustainable improvement is often introduced through some form of organisational initiative. The question of how initiatives start and how they are sustained if there is no concept of leadership but purely a traditional management approach within the organisation needs to be considered. How can reversion back to old practices in times of crisis or hardship be avoided? Thus, to provide focus to the research in line with the above discussion and as explained in more detail in section 2.1.4, a number of research questions have been developed and tested within this thesis together with an overall research aim. These are:

Research Aim:
The overall aim of this research is to develop a model that can be used by manufacturing organisations to improve the success and sustainability of performance improvement initiatives.

Research Questions
1. Is it true that organisations introduce too many initiatives many of which fail to produce the benefits for which they were originally introduced?

2. What are the factors that influence the success or failure of an initiative?
   2a. What are the reasons for the success of improvement initiatives?
   2b. What are the reasons for the failure of improvement initiatives?
   2c. What factors need to be established or present when an improvement initiative is introduced that will make it more likely to be a success?
   2d. What factors need to be established or present when an improvement initiative is introduced that will make it more likely to be sustained?
3. Are management failing to take a strategic and planned approach to the introduction and sustainability of improvement initiatives?

This research tests and draws conclusions relating to the research aim and the research questions stated above.

1.3 Justification For The Research

How often has the latest 'save the business' initiative failed to live up to its initial excitement and is ditched for a new bigger, better, state of the art opportunity? Senge (1999:5-6) wrote:

Most change initiatives fail. Two independent studies in the early 1990s, one published by Arthur D. Little and one by McKinsey & Co., found that out of the hundreds of corporate Total Quality Management (TQM) programs studied, about two thirds 'grind to a halt because of their failure to produce hoped-for results.' Reengineering has fared no better; a number of articles, including some by reengineering's founders, place the failure rate somewhere around 70 percent. Harvard's John Kotter, in a study of one hundred top management driven 'corporate transformation' efforts, concluded that more than half did not survive the initial phases...Clearly, businesses do not have a very good track record in sustaining significant change.

Total Quality Management (TQM) was developed and then sold as a process that needed to be forever and would produce significant business improvements through empowering and mobilising the people over the long term. Many organisations have discarded TQM even though the benefits only begin to reap significant rewards when the culture has developed to a level of trust and empowerment that allows many of the techniques and improvements to be fully realised and exploited. It is this endless (and sometimes mindless) pursuit of the next improvement initiative that is being investigated and discussed within this research.
In addition, the research will investigate the process used to initiate and introduce performance improvement. Further evidence that organisations are pursuing the Holy Grail of improvement initiatives came from the research itself, described in Chapter 4.

As long ago as 1982, Deming, outlined fourteen action points for the transformation of American Industry. The first of these reinforces the need for sustainability of improvement and is:

Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.

(Deming, 1982:23)

As well as a lack of constancy of purpose there is a gap in the training and education of managers in respect of business improvement initiatives. The process of continuous improvement is usually taught through the introduction of a specific initiative such as Lean Manufacturing or Kaizen. Teaching is often linked to a specific means of introducing a particular initiative and sold as the right way for all organisations and subsequent initiatives. But is it? The uniqueness of an organisation in respect of its culture, management style, history and technology is rarely considered or seen as relevant.

A powerful example of this approach was the generally accepted implementation process for Materials Requirements Planning (MRP) and Manufacturing Resource Planning (MRPII). These used a structured, proven path approach developed by the Oliver Wight organisation. A single process of implementation was used for all organisations, large or small and with different cultures, needs and management styles. The proven path can be a method that has evolved through many years of trial and error. However, this path may have originated within organisations that had a distinctive, almost alien culture from where many organisations are currently starting. Kaizen (Imai, 1986) is a good example of this with its high dependency on involving the entire workforce through the use of improvement teams. No process or alternative is discussed which helps to create this team-based culture within traditional, autocratic organisations.
Initiatives such as Business Process Re-engineering, again powerful tools and techniques with significant business gains being possible, are sold as ways of making the business leaner and more customer focused. Unfortunately in many cases implementation is usually performed on the organisation not with the organisation. Hardly the way to encourage involvement, trust and empowerment. However, this does not mean that initiatives are worthless and improvement should be put on hold. Many organisations obtain significant benefits even if they fail in the eyes of the purist. What appears to be a weakness is that organisations fail to determine specifically what they want to improve and how they can improve it. They also fail to measure progress and re-evaluate whether they are succeeding or not. Many initiatives just whither away and people become disillusioned and see any attempt at further improvement as a game.

The research undertaken resulted in the development of a model to assist organisations to introduce successfully and sustain performance improvement. The model considered how to continually monitor progress and to take account of the three approaches to change illustrated in Figure 1, the range of factors identified in Figure 2 and the taxonomy of improvements developed in Chapter 2. The difference from conventional thinking and management of performance improvement is that a broader range of factors was considered and the improvement process was developed to expect and manage change and flexibility of approach.

The model overcomes the misconception of fitting the organisation to an improvement initiative, or the latest fad, through an initial emphasis on developing the ‘whats’ and ‘whys’ prior to the selection of the appropriate initiative (or hows). This results in the selection of an initiative or combination of initiatives that fit the organisation’s requirements not vice versa.

The model has been developed to encourage management to take consideration of an individual company’s culture, structure and responsiveness or openness to change and the type and pace of change required to determine an appropriate improvement process.
for the organisation. This approach can be described as a contingent approach to the
process of performance improvement.

The use of the Initiative Measurement Process (IMP) is an important innovation within
the overall use and application of the model as it provides a potential success rating for
the performance improvement process, developed by the application of the model, and
can also be used as an ongoing success measure.

The model represents a significant contribution to knowledge in the areas of sustainable
performance improvement and as a practical tool.

1.4 Methodology
The selection and development of the appropriate research strategy and tactics used to
test the research questions are described in detail in Chapter 3. Research strategy is
concerned with determining the relevant approach or methodology, whilst research
tactics are the more detailed decisions related to the design and development of specific
tools. Table 1 illustrates the extensive primary research that was undertaken to test the
research questions, provide background information in respect of the research aim and
development of the model and also provide further justification to support the need for
this research.

<table>
<thead>
<tr>
<th>Area</th>
<th>Primary Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Aim</td>
<td>Initiative Measurement Process (IMP) – Case Studies</td>
</tr>
<tr>
<td>Research Question 1</td>
<td>Survey of Automotive Companies</td>
</tr>
<tr>
<td>Research Question 2</td>
<td>Case Studies</td>
</tr>
<tr>
<td>Research Question 3</td>
<td>Case Studies</td>
</tr>
</tbody>
</table>
| Development and Testing of the Model | Pilot experiment  
Three experimental implementations in three organisations |
Justification for the choice of methodologies is explained in more detail in Chapter 3 where three areas are discussed:

- Informational Adequacy
- Efficiency
- Ethical Considerations

The results obtained from the survey of manufacturing companies and the case studies fully justified the methodologies used.

1.5 Outline of the Thesis

This chapter, Chapter 1 has put the research into context and provides an overview of the detailed information to follow. The chapter introduces the research questions and the overall research aim.

The research definition is discussed and developed during Chapter 2. This chapter consists of a detailed literature search together with development of the three main research questions and the research aim.

Following the development of the research questions in Chapter 2, Chapter 3 describes how the methodology for testing the research questions was developed. Chapter 4 then describes the use of the survey with automotive suppliers in Wales. Following the development of the survey and its use, Chapter 4 then discusses the results and findings from the survey and further work that resulted from the exercise.

Chapter 5 focuses on the development of the case studies. This links closely with the testing of Research Questions 2 and 3 and also provides essential information for the development of the sustainable improvement model. The structured questionnaire is developed in Chapter 5 and this is used as the data collection tool for the case studies. This chapter ends with some important recommendations and conclusions, which contribute to the development of the final model.
The development and testing of the model is described in Chapter 6. The model was based on extending existing best practice and theory from the literature review carried out in Chapter 2 and the case studies and survey described above. The model was piloted, three detailed experiments were carried out and effective outcomes for each of the organisations were developed. Conclusions are drawn and ideas for improving the model are discussed.

Chapter 7 contains the recommendations and conclusions related to the research questions and overall research aim. Section 7.4 suggests ideas for further work and the chapter and research concludes with a summary of conclusions in Section 7.5.

1.6 Delimitation of Scope

The aim of this research is to develop a model that can be used by manufacturing organisations to improve the success and sustainability of performance improvement initiatives. It was considered to be an important characteristic of the model that it was grounded in field-based research and appropriate literature reviews.

During the development of the model, and when undertaking the research, it was recognised that an important factor in organisational change is individual change. The need to understand how to change mindsets and incorporate change within individuals and thus influence culture change was also recognised and noted. However, even though comment is made regarding the importance of individuals within a change situation this research does not investigate and comment on how to change mindsets and paradigms at a specific, individual level. This is recommended as a topic for further work, as it was not feasible to include this within the scope of this research.

The research undertaken and the subsequent development of the model were specific to the manufacturing industry. No primary research was carried out in the service sector as such even though one of the experiments was conducted in the Service Department of a manufacturing organisation - Panasonic. All of the companies included in the initial survey were discrete part suppliers to the automotive industry. The case study research
consisted of six case studies in three organisations, two of which were discrete parts, automotive suppliers whilst the third was a discrete products supplier to the pharmaceutical industry. The experiments were carried out in three organisations and are described in Chapter 6.

Finally, the organisations surveyed in Chapter 4 varied from very small organisations to a major employer within Wales. The three organisations that agreed to undertake the case study research, although divisions of multinational corporations were medium to large enterprises in their own right with their own management team and autonomous decision making process. The three experiments were carried out in an SME, a division of a multi-national and a medium size enterprise. Each of the organisations had its own autonomous management team.

1.7 Conclusion

This chapter has summarised the main elements of the research and set the scene for much of the work that follows. Delimitation of scope in respect of the research undertaken and the outcomes has been discussed.

The research focuses on how the research aim was achieved through the development of a practical tool which supports the introduction and sustainability of performance improvement in manufacturing organisations. The introduction to this chapter provides some justification for the research and also attempts to put the research into context. However, in order to understand and appreciate the detailed arguments and discussions developed it will be necessary to read and understand the whole document.

Chapter 2 will commence the process of understanding the practical and conceptual problems through an extensive literature review focused on change, improvement and improvement processes. In section 2.1, the research questions are clarified and developed. Section 2.2 provides background information in areas such as culture and change models that contributed to the development of the model.
Chapter 2
CHAPTER 2: LITERATURE REVIEW

2.1. RESEARCH DEFINITION

2.1.1 Introduction and Background

This chapter investigates improvement processes and the problems of effecting and effective organisational change through a critical analysis of appropriate literature. The main outcomes of this review are a research aim and a set of research questions that formed the basis for the primary research that was undertaken subsequently. Analysis of the literature that deals with approaches or models that claim to provide methods for effecting change within organisations together with the primary case study research provided the background information for the development of the model in Chapter 6.

Effective organisational change has long been a subject of interest to academics, consultants and practitioners. The literature on organisational change as a generic problem can be traced back to the work of pioneering social psychologists such as Elton Mayo (1946), who was the leader of a research study of production team effectiveness at the Hawthorne Plant of the Western Electric Company during the period 1922 – 1932. The Hawthorne Studies (as they became known) offered important insights into the motivation of workers and the main findings were:

- People and their motivation were critical to the success of the business
- There was a link between morale and output. Changes in working conditions led to increased output.
- It is important to restore humanity to the workplace
- The importance of group cohesion, the feeling of belonging to a group led to an increase in productivity

Of perhaps equal significance was the stimulus that the success of the studies gave to other work and the contributions of Lewin (1951), McGregor (1960) and Schein (1985) have been particularly influential.

Kurt Lewin is widely recognised as the founder of modern social psychology. He pioneered the use of theory, using experimentation to test hypotheses. He placed an
everlasting significance on an entire discipline – group dynamics and action research and he is well known for his work on group dynamics and t-groups.

Lewin was also one of the pioneers of organisational change and developed a simple but effective three stage model of change. His model proposes that firstly, people have to be unfrozen from their current position. Then the change is introduced through interventive actions (create movement) and finally the organisation has to restabilise or refreeze the change into the new situation for this to become the established methodology or process. Lewin is also responsible for introducing force field analysis which is used in his change model to examine the driving and resisting forces in the change situation.

Lewin considered that a complex, stepped process of unfreezing, changing and refreezing beliefs, attitudes and values was required to achieve change, with the initial phase of unfreezing normally involving group discussions in which individuals experience others’ views and begin to adapt their own. Lewin’s model is often criticised for its linearity and as being overly simplistic because it assumes that organisations are continually refreezing to consolidate change and then unfreezing to introduce the next change. In reality, due to the dynamic and fast paced nature of change, it is likely that the organisation is continually in a state of flux, with many mini change processes occurring as individual projects or ongoing incremental improvements. However, in defence of Lewin the model was originally process orientated and Lewin himself viewed change as a continuing process recognising that extremely complex forces are at work in group and organisational dynamics. (Lewin, 1951). Lewin’s classic model of change intervention remains one of the simplest and most useful and he is widely recognised as a seminal figure in social psychology and much subsequent management thinking and research has been influenced by his thinking.

McGregor (1960) suggested that there were two extreme approaches to managing people which he designated theory ‘X’ and theory ‘Y’. He highlights the potential for a
more enlightened approach to human relations management and paved the way for approaches such as empowerment and the learning organisation.

Schein (1985) was one of the first management theorists to define corporate culture and recognise the underlying importance of corporate culture in the process of change. This has particular significance for the development of the model for evaluating the readiness of an organisation to undertake a change initiative.

The widespread emergence of the business schools in the late 50s led to an approach to change that emphasised the importance of the leadership of the organisation. Leadership is now a much researched topic. James (1996) suggests that an important leadership skill for the 21st century will be to learn how to respond to and master the process of change and that leaders will have to be able to develop a clear vision of where the organisation is going and how it is going to get there.

Process based change, based around organising the means of production, has emerged from Taylor's (1911) approach to improvement based on his concept of scientific management. Taylor's hugely influential work gave rise to the development of work study techniques and what came to be known as production or industrial engineering by his immediate associates Frank and Lillian Gilbreth, Henry Gantt and then by many others. The contribution made by industrialists was of equal if not greater importance as is exemplified by the work of Henry Ford. Writing of the reasons for his company's purchase of the Detroit, Toledo and Ironton Railroad, he states:

> We discovered, after a little experimenting, that freight service could be improved sufficiently to reduce the cycle of manufacture from twenty-two to fourteen days. That is raw material could be bought, manufactured, and the finished product be put into the hands of the distributor in (roughly) 33 per cent, less time than before. We had been carrying an inventory of around $60,000,000 to ensure uninterrupted production. Cutting down the time one third released $20,000,000, or $1,200,000 a year in interest. Counting the finished inventory, we saved approximately $8,000,000 more—that is, we were able to release $28,000,000 in capital and save the interest on that sum. (Ford, 1922:175)
The significance of this statement lies first in the fact that it identifies a conscious effort at performance improvement; in today's terms an improvement project was carried out. The second significance is the nature of the project which had an experimental basis. Finally, the object of the experiment was to reduce the duration of the manufacturing and logistics cycle. Ford's text is imprecise about the exact date of the experiment but it can be dated as certainly before the first publication of My Life and Work in 1922. The importance of the themes of time-based competition, inventory reduction, and experimentation were all rediscovered sixty years later.

During the same period another pioneer of improvement was working as a member of the technical staff of Bell Telephone Laboratories. W.A. Shewhart undertook an investigation starting in 1924 to 'develop a scientific basis for attaining the economic control of quality of manufactured product.' (Shewhart, 1931: vii). Out of this work came the technique of statistical process control and the establishment of quality as an improvement issue. This information was taken up notably by W.G Magil, W.E. Deming, and Joseph Juran who took Shewhart's ideas to Japan as part of the support for the reconstruction of Japanese industry (Kondo 1988: 35F.3).

Statistical process control and other approaches to the improvement of quality were widely applied by Japanese manufacturers in a wide range of industries. However, the most influential of these (at least in western industry) has been its contribution to what became known as the Toyota Production System (Shingo 1989).

In the years from 1970 onwards Japanese manufacturers emerged as significant competitors for western companies, often coming to dominate whole industries. As a result, those concerned with the future prosperity of western manufacturing sought the 'magic formula' that had made Toyota and its like so successful (Schonberger, 1982; Womack, Jones and Roos, 1990). They rediscovered a plethora of improvement techniques and approaches and some new ones too. All had the potential to improve the performance of western manufacturers if only they could be implemented successfully; the improvement initiative was born.
Figure 1 represents a taxonomy of the three different approaches to change described above, where level 1 relates to the strategy and leadership of the organisation, level 2 considers the organisational context including structure, culture and models of change (for example, Lewin, 1951) whilst level 3 evolves from organisation of the means of production and is focused on changing or improving the manufacturing process. One of
the arguments proposed during this research is that the planning and execution of organisational change and more specifically performance improvement still relies heavily on a process approach based on the Taylor model and that there is not a unified, all embracing approach to change that combines the three levels shown in Figure 1.

Not only should organisations consider and develop change programmes that combine the three levels shown in Figure 1 they also need to take into account a broader range of factors to ensure successful implementation and sustainability. Figure 2 proposes a more complete approach to organisational change. Figure 2 represents organisational (not individual) change and more specifically performance improvement. Merli (1995) defines improvement as a total organisational effort to correct problems and boost performance. Figure 2 suggests that performance improvement consists of two activities, continuous improvement and step change. Merli defines continuous improvement as a series of small, incremental but unending steps towards the goal of excellence. He also suggests that when the process seeks improvement through larger steps then these are usually described as breakthroughs or step change, re-engineering being a popular example. The concentration of all efforts on the same or focused objectives is a basic principle of step change.

The difference between step change and continuous improvement is not always clear and can depend on an individual's position in the organisation. For example, Lindberg and Berger (1997) observe that what may be perceived as radical to a shop floor worker - a new layout of their area or different method of materials handling could be viewed as part of an overall continuous improvement programme and merely an incremental improvement in respect of the overall strategic or long term plan by senior management. They attempt to reduce this gap in understanding by suggesting that continuous improvement is a planned, organised and systematic process put in place (and ideally continuously improved) by management. The result is a substantial improvement in manufacturing performance through a series of adaptive improvements.
Figure 2: Performance Improvement
Lindberg and Berger (1997) distinguish between radical change and incremental change giving simplistic examples where Business Process Engineering (BPR) is generally regarded as radical and Total Quality Management (TQM) as incremental. This is a rather narrow viewpoint because the changes that are introduced through a concerted attempt at TQM over a period of time (say five years) can be regarded as radical, even revolutionary. But the point they make is relevant in that TQM is usually recognised as an ongoing, forever process and BPR as a one off activity. They also raise the issue as to which is the umbrella initiative. An example of an umbrella initiative was provided by Imai (1986:4). He suggests that, 'Kaizen is an umbrella concept covering most of the uniquely Japanese practices that have recently achieved worldwide fame.' Within the umbrella of kaizen he included such concepts as kanban, Just-In-Time, QC circles and Total Productive Maintenance (TPM) and in his opinion kaizen is the driving force or common denominator that supports the introduction of each of the other initiatives. Thus Lindberg and Berger's question regarding umbrella initiatives is whether continuous improvement is a part of TQM or is TQM a part of continuous improvement? Perhaps more relevant is whether it matters as long as the organisation's members are clear in their understanding and use of these improvement processes.

Unfortunately, what has become evident from the literature is that managers are not clear in their understanding and use of improvement initiatives. Generally, these improvement initiatives are not considered in a systematic or 'what's right for us?' perspective but merely sold as products. One possible reason for this is the lack of a good, agreed taxonomy for this type of change. Figure 3 is an attempt to introduce such a taxonomy using the initiatives from the survey developed in Chapter 4. Level 1 constitutes the competitive environment and the two basic requirements of performance improvement – the elimination or reduction of waste and the improvement of quality. Level 2 initiatives are broad based initiatives that fit within the waste, quality streams whilst Level 3 represents more specific initiatives. In an attempt to overcome the difficulty of fitting initiatives specifically into either waste or quality, as some initiatives are appropriate to both activities, a continuum that represents varying degrees of quality and waste is shown.
Thus an initiative such as SMED which can reduce the ‘waste’ associated with changeover times is positioned mainly within the waste stream and as one of the techniques closely associated with JIT and Lean Manufacturing. However, it is well known and documented (Shingo, 1985) that improvements in changeover time, through standardisation of the changeover process, not only reduce the changeover time but also result in quality improvements. Nevertheless, the main purpose for the introduction and use of SMED is to reduce waste ‘time’ and the placing of SMED on the continuum represents this.

Figure 3: Taxonomy of Improvements
A further argument proposed within this research is that there is a lack of a strategic approach that embraces both implementation and sustainability of performance improvement and also considers the organisational setting and selection of an appropriate level 2 and level 3 (Figure 3) improvement initiative.

Kidd (1994) supports this need to consider one organisational setting by pointing out that we should clearly understand the existing culture and the implications of proposed changes before embarking on the process of change. The existing culture will influence the approach to change and the speed with which the change can be effected. This tends to be an often overlooked factor as organisations blindly follow the latest fad using the recommended proven path without due consideration of their own unique characteristics.

Thus, it is suggested that the approach to organisational change tends to be fragmented, failing to consider the three levels introduced in Figure 1, not considering the various factors introduced in Figure 2, and that ultimately there is a gap between strategic 'long-term' thinking and planning and operational activity or implementation - Figure 4.

Figure 4: Operational Change / Strategy Gap
Section 2.1.3 looks in more detail at strategy and the role of strategy in an improvement programme and investigates further the argument of an incomplete strategic approach to performance improvement.

So why is it that, according to Andrews and Stalick (1997), so many well-meaning attempts to bring significant change to organisations fail? What, they ask, is it that allows the resistance to change to overcome the change itself?

Market changes are one of the major driving forces behind the requirement to change manufacturing processes and the approach. Customer demand is fuelled by the need to have the latest version of a product or even the latest product. This requires a response by sales and marketing and in time manufacturing have to respond to satisfy this changing demand.

This results in the trends shown in Figure 5, reductions in production volumes, increasing product variety, shorter product life cycles (as companies strive to keep their products up to date and respond to customer demand) and a reducing number of repeat orders.

![Figure 5: Market Trends](source: Kidd 1994, Fig 1.2, p 14)
Goldman, Nagel and Preiss (1995) suggest that these market trends originate with marketing strategies, which offer shorter lifetime products, and models aimed at smaller, niche markets. The pace of new product development and introduction has become critical to success and profitability in certain industries, typically mobile phones and Personal Computer manufacturing, and flexible, responsive enterprises and systems are regarded as essential to support these. They suggest that mass production thinking with long runs and limited variety has now become a competitive liability in many industries where rapid product development and time to market are critical. The need for a more successful approach to organisational change where organisations understand what changes they need to make and how to make them has never been greater.

However, changing an organisation is a major task and a wide range of issues need to be addressed. As suggested, it would be helpful from a management perspective if there was a model or approach to change that would help management to consider the issues and develop and implement an effective change programme for their organisation. Unfortunately, as Collerette, Schneider and Legris, (2001) point out there is no consistent theory or approach to change: a step-by-step approach is advocated by Abrahamson (2000); Hamel (1997) proposes revolutionary step change; a third calls for caution in the face of change viewed as a fashion (Peter Brabeck, CEO Nestle) and Christensen (1997) warns against any change that goes beyond the company's absorption capacity. The argument proposed in this research is that all the approaches are relevant and appropriate, but not to every company at all times.

Typically, implementing change requires movement of an organisation to some future state. This will be the state that, ideally, is desired to exist after the change. As discussed earlier Lewin (1951), one of the pioneers of organisational change, developed a simple but effective three stage model. Since Lewin, many approaches to managing and understanding change have been developed. Cameron and Green (2000: Table 3,119-120) compare nine models of change. Unfortunately even though each of the models is convincing up to a point, none of them 'appears to tell the whole story'. (Cameron & Green, 2000:118)
To confuse matters further Whyte (1967) suggests that organisations need to become more flexible and inventive in developing and applying change models. Managers, according to Whyte, need to be much more flexible and be capable of developing their own models and not have to operate with a limited number of models of organisational change. Unfortunately, this approach is based on the misguided expectation that all managers will want to become adept at change and change theory and that they will be able to discuss, debate, agree and select (or develop) a change model to use for their organisation. Often managers do not have the time or motivation to understand organisation theories of change, strategy implementation 'emergent vs. planned' or any other theory. What they need is a process that will help them to achieve real, successful, sustainable change or performance improvement within their organisation. A route map that works for them, not a prescriptive change process. A contingent approach to developing, introducing and sustaining organisational change. A prescriptive process that will help them to develop their specific approach to change for their organisation.

The change model, therefore, has to be grounded in appropriate theoretical and practical approaches to change, be broad enough to encompass the levels of change described in Figure 1 but specific enough to enable management teams to develop appropriate, relevant and workable change solutions for their organisations. The hard lesson according to Heller & Spenley (2000) is that it is no use tackling just one or two aspects of a company, everything needs to be done, from shopfloor relationships to high-level strategy. Likewise, Pettigrew et al (1992) suggest that the linking of strategic and operational change is a central factor in the management of change.

Burnes (2004: 328) suggests a menu approach to change whereby organisations or more accurately those who manage them, can choose the approach which fits their circumstances. This approach is in line with Dunphy and Stace (1993:905) who discuss the need for a situational or contingency model that will help to determine how to vary strategies to achieve 'optimum fit' with the changing environment.
This introductory section has clarified and defined incremental improvement and step change and recognised that rapid and relentless change is being forced upon organisations from increasing customer demands, product variety and growing global competition. The need to focus on a broader, but possibly more controlled and methodical approach to organisational change has been discussed. A number of weaknesses when organisations introduce performance improvement have been identified and the need for a more complete approach that:

- supports both sustainability and implementation of performance improvement
- embraces levels 1, 2 and 3 of Figure 1
- considers the organisational setting, including culture
- selects appropriate and relevant improvement initiatives based on the taxonomy developed in Figure 3 and
- fills the gap between strategy and operational change.

The remainder of Section 2.1 will investigate these issues and develop the research questions. The next section will discuss typical issues that arise within organisations that attempt to introduce and sustain improvement initiatives.

2.1.2 Change – Issues that Inhibit Sustainability

The previous section provided a general background for the need to change and highlighted that organisations need to move to a more complete approach to change which combines the three levels shown in Figure 1 and also considers the broader range of requirements shown in Figure 2. Many academics and business leaders agree that change is a necessity and those companies that fail to change will fall far behind. It is also generally agreed that the concept and execution of change are not easy and Caperelli (1996:36) reflects this difficulty and lack of success, stating that ‘the process of change can be disruptive, difficult and uncomfortable, forcing some companies to abandon their plans for change.’
This section looks at typical issues that arise when organisations attempt to introduce new techniques or improvement initiatives and more specifically how they can be sustained. On one hand there is now more advice on how to manage change than ever before, however, on the other hand 'the failure rate of change initiatives is astronomical' (Burnes, 2004: 5) Organisations introduce improvements that can be regarded as successful, but they often occur at a superficial or parallel level when compared with the daily business of the company. This section investigates further the idea of sustainable improvement by which is meant that the process of performance improvement and improvement initiatives are fully integrated into the organisational fabric and become the normal way of doing business.

Many organisations attempt to increase their competitiveness by introducing what they consider to be the latest technique. Abrahamson (2000) suggests that change creates initiative overload and organisational chaos. He suggests that in order to change successfully, companies should stop changing all the time. A study by Bonvillian (1997) that examined change initiatives in major North American companies over a five year period found that 42% carried out eleven or more initiatives, 47% between six and ten and 11% between one and five. As a result organisations fail to take full advantage of the potential benefits of the initiatives that they attempt to introduce, given the commitment required to enable success in even one major improvement process let alone ten or eleven. Bonvillian (1997:20) observed that:

... the most severe indictment of overzealous change initiatives is apparent in the failed attempts to re-engineer organisations. Leading practitioners of this second-generation quality-driven change philosophy have reported that success rates in FORTUNE 1,000 companies are well below 50% and some are as low as 20%.

The pressures on organisations to improve have never been greater and subsequently the pressure to introduce a new initiative or change process is significant. This unrelenting pressure to improve and produce better results can result in the introduction of specific improvement initiatives, possibly for the wrong reasons. To add to the confusion Grint (1997) suggests that at least one new three-letter acronym (TLA) or
fashion emerges every year and he proposes five different approaches, which he calls waves that can be used to describe these fashions.

In Grint’s opinion the majority of change programmes fail, Beer & Nohria (2000) suggest that the failure rate could be as high as two thirds of the change efforts undertaken. The cause and a consequence of this being the search for an initiative that will deliver a solution overnight. This may of course be another reason why there appears to be so many new initiatives being undertaken by organisations on an apparently ad hoc basis. As Deming (1982:126) suggests there is an expectation or hope for ‘instant pudding’ that has become an obstacle to improving longer-term, ongoing effectiveness:

Letters and telephone calls received by this author [Deming] disclose prevalence of the supposition that one or two consultations with a competent statistician will set the company on the road to quality and productivity – instant pudding.

Grint suggests that change programmes are normally initiated by senior managers but then alter as they evolve through the management hierarchy and are taken on board by middle management and team leaders. In his opinion many change programmes are discarded and new ones adopted not because they have been evaluated as good ideas or superior to the current initiatives but because they are fashionable. The problem, however, is that fashions change and change programmes also change in line with the new fashions leading to a lack of consistency and the appearance of an organisation without a coherent strategy for improvement.

The institutional approach described by Grint creates an environment in which organisations follow one another in what he describes as a whirlwind of change. However, because these initiatives are often adopted as flavour of the month, with little real support or management commitment, they quickly lose their initial impact and potency. Eventually Grint (1997:735) suggests that this new initiative:

is progressively eroded to the point where the very term becomes a cliché for old fashioned.
The result is that the initiative is discarded or dies naturally and the latest TLA is introduced and the whole process starts again. The effects of this can again be that of an organisation that appears to have no coherent and consistent plan for development.

The dilemma, Grint suggests, is that if organisations resist the temptation to change for change sake, and stick with their current initiatives they may be labelled as old fashioned and no longer be regarded as at the cutting edge and start to lose the confidence and support of their customer base. Again this relates to the reasons why organisations take new initiatives on board and possibly ditch current initiatives. Interestingly Abrahamson (1991: 609) offers an alternative view and suggests that possibly 'the cost of adopting and rejecting multiple fads or fashions in order to fund a technically efficient innovation may be much lower than the returns from this innovation.'

This point tends to support the need for a process that will help management teams to select and sustain appropriate performance improvement initiatives. The 'trial and error' process described by Abrahamson may be one cause of organisations rejecting initiatives due to what Collerette et al (2001) describe as premature wear which is identified by chronic fatigue, dwindling creativity and withering enthusiasm for further change.

Grint's five approaches are interesting and useful; however, his work appears to be incomplete as there is a possible sixth approach that he has not considered. This occurs when large corporations (such as Ford or General Motors) drive improvement initiatives through their supply chain. Often the introduction of these initiatives (for example, Statistical Process Control, QS 9000) becomes one of the conditions to be satisfied to maintain approved supplier status. Unfortunately, these improvements or initiatives are often regarded as necessary evils and are given minimal support by the supplier other than to satisfy audit requirements from the host company.
Andrews and Stalick (1997) propose that nine organisational dimensions must be targeted in any change effort as illustrated in Figure 6. They propose that the physical/technical layer is the most concrete and the easiest to change, however they warn that

...once changed, these physical/technical dimensions rapidly erode, back to their original state, if there are no mechanisms for reinforcing the new behaviours.

(Andrews and Stalick, 1997: 6)

Figure 6: A Model for Organisational Change
(Andrews & Stalick 1997, Exhibit 1, p 6)

This 'erosion back to the original state' supports the concept of driftback described by Ratcliffe (1997) who suggests that driftback is when organisations revert to old practices in times of crisis or confusion, possibly due to incomplete application of the third stage, refreezing, of Lewin's change model. Andrews and Stalick suggest that driftback will occur naturally if the new initiatives are not reinforced regardless of whether there is crisis or confusion to act as a catalyst. They explain that it is the function of the
infrastructure and value layers to provide the reinforcement mechanisms that are so essential to prevent driftback. They suggest that these reinforcement mechanisms can be provided through utilisation of the infrastructure layer to introduce specific programmes and systems to reinforce changed behaviour.

This would include developing reward and compensation systems to encourage people to act in certain ways, measurement systems to provide feedback and management policies and practices, which define the authority and decision and rules that empower the people who perform the work. It is the value layer that, according to Andrews and Stalick, contains the deepest and most difficult type of change. They state that 'lasting organisational transformation, which significantly increases the organisation’s sustained capabilities to achieve its business vision and strategy, requires multidimensional change solutions” (Andrews and Stalick 1997:6).

Not all organisations fail at the first hurdle resulting in the initiative dying or quietly fading away. Many organisations introduce changes that appear to last and change the way that they conduct or manage their business. Unfortunately, many of these changes occur at a superficial level when compared with the daily business of the Company. A typical example is the use of quality systems such as ISO 9000 being purely cosmetic whilst the real quality system operates alongside.

Pascale, Milleman and Gioja (1997) suggest that companies have struggled with sustaining change and introducing improvements. They are also concerned that the pace of change is accelerating and organisations have to keep investing more and more resources into change programmes. As they put it:

- The treadmill moves faster, companies work harder, results improve slowly or not at all.
  
  (Pascale, Milleman and Gioja 1997:127)

They also argue that it is not the programmes which are at fault; it is in their view the lack of an appropriate volume of committed people. The underlying issue, they suggest, is that the number of people who make committed, imaginative contributions to
organisational success is too small. In order to sustain a change process every person
within the organisation needs to be committed and driving change.

Roehm, Klein, and Castellano (1995) describe an attempt to create an integrated
improvement in their case study of Grand Rapids Spring and Wire Products Company.
However, the article fails to give sufficient credit to the leadership role of the plant owner,
Jim Zawacki, who was the champion for many of the initiatives. He was also paramount
in changing the company structure, providing training for the workforce and moving
deliberately towards the creation of a learning organisation. This helped to develop a
culture, which supported the introduction and development of improvement initiatives.
An important message which emerged from this case study was that each individual
plant required its own tailored improvement mechanism or process.

Dale, Boaden, Wilcox and McQuater (1997) describe how total quality management can
be sustained based on fieldwork undertaken at six organisations (twelve sites). The
paper describes the main issues that impact on the sustaining of TQM. Sustaining is
described as the maintaining of a process of quality improvement. The issues and
categories discussed in the article are summarised in Table 2.

Table 2: TQM Sustaining Categories and Issues
(Dale et al 1997, Table 1, p 373)

<table>
<thead>
<tr>
<th>Internal/External Environment</th>
<th>Management Style</th>
<th>Policies</th>
<th>Organisation Structure</th>
<th>Process of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Environment</td>
<td>Industrial Relations</td>
<td>Policies that may conflict with TQM</td>
<td>Positioning of the quality, function</td>
<td>Improvement infrastructure.</td>
</tr>
<tr>
<td>Employee resourcing, development and retention</td>
<td>Resource Management</td>
<td>Communication</td>
<td>Teams and teamwork.</td>
<td>Procedures:</td>
</tr>
<tr>
<td>Internal Environment</td>
<td>Management / worker relationship</td>
<td>Financial Management</td>
<td>Job flexibility and cover</td>
<td>Quality, management system.</td>
</tr>
<tr>
<td>Customer focus investment</td>
<td>The 'fear' factor</td>
<td>Maintenance Manufacturing</td>
<td>Supervisory structure</td>
<td>Quality: management tools and techniques.</td>
</tr>
<tr>
<td>Investment</td>
<td></td>
<td></td>
<td></td>
<td>Confidence in management</td>
</tr>
</tbody>
</table>

30
Dale et al make the significant point that there are a number of factors outside the direct control of the managers that have an effect on the improvement process and that managers need to be aware of these factors in order to plan around them. This includes the ability to be able to react to the threat of competitors, recruit and retain high calibre employees and also provide appropriate development opportunities. Collerette et al (2001) observed that the pressures for change in the 1990s moved significantly from internal pressures to an external focus, or environmental factors, causing much disquiet and pressures on organisations to navigate in a much more turbulent and uncontrolled setting.

Dale et al describe the 'fear factor' as the uncertainty felt by employees about their future. A typical example is when an area or activity that commits to an improvement initiative loses people because of the 'success' of the initiative. This results in a lack of trust between managers and the workforce and creates problems when introducing and sustaining, TQM or any other improvement process.

A unitarist approach, that is one with managers and workers sharing the same objectives, should be adopted, according to Dale et al, by organisations utilising the concepts of TQM. And, indeed this idea underlies much of the thinking written in this area. Management must also, in their view, move away from the approach based around Taylor's scientific management (Taylor, 1911), which results in low trust and low discretion, to one utilising self managing work groups, empowerment, increased participation and the involvement of employees in decision making.

Dale et al also found that many organisational policies conflict and are inconsistent with the sustainability of performance improvement. They also propose that organisation structure is another important category for consideration. Typically, they suggest, hierarchical structures and bureaucracies should be weakened to reduce departmental and functional boundaries and encourage the inception of cross functional working and teamwork and that cross-functional communication must be developed.
The fifth column in Table 2 relates to the process of change and Dale et al suggest that the six areas listed are typical of the issues that arise when introducing TQM. Dale et al (1997) summarise by emphasising that senior management commitment, training, motivation and so on, although vital to the process, are insufficient on their own to bring about a continuous improvement ethic. They also suggest that it is vital that there is... 'senior management vision, direction and support and a collective sense of purpose to achieve a common goal' to ensure that improvement initiatives are soundly based and prevent the organisation being pushed down blind alleys. (Dale et al 1997:380)

Grint (1997) discusses some of the causes of failure and the subsequent lack of sustainability of improvement initiatives. Performance measures for monitoring and determining success being developed by experts from above, not the people at the factory floor level, being one of his examples. He suggests that forcing compliance to these imposed measures leads to an inevitable lack of ownership and commitment and eventual failure of the initiative. He also refers to improvement programmes that not only lose purpose and direction but exist as a system irrespective of their actual need or validity within the organisation. This can sometimes be the case with quality systems such as ISO 9000 that often appear to take on a life of their own.

Sheridan (1997) looks at successful or winning organisations in a report on the 1996 winners and finalists of Industry Week's Best Plants in America competition. He indicates that success and sustainability is related to culture and that the best sites have cultivated a culture that embraces the need for change. Other important observations from Sheridan are related to the attitudes and actions of middle management who he believes do not necessarily follow the lead set by top management and can make or break an improvement process. He suggests that the trust factor is critical and is controlled and influenced by middle managers, not senior leadership.

Following the lead set by top management may be difficult as the real barriers to sustainability and successful change could be the thinking and lack of knowledge at the strategic development level of an organisation. This lack of progressive thinking is
illustrated by Kidd (1994), who suggests that in many cases our traditions and approaches are so antiquated and inappropriate that they constitute a competitive liability. Typical of these, according to Kidd, are outdated and ineffective accounting systems, organisational structures based on hierarchical control and designed to maintain the status quo rather than support change and management attitudes towards their people based on the Taylor model of top management as thinkers, middle managers as controllers and workers as doers.

Kidd further reflects that not only is manufacturing highly complex, it also involves many interrelated issues, and covers several disciplines. He suggests that performance improvement programmes fail to recognise this complexity as the approach taken is often reduced to following a simple methodology or adopting a number of prescriptive quick fix solutions, which focus on one, or a few particular aspects of manufacturing. He suggests that this simplistic approach has been adopted in a piecemeal fashion and because of this it has often been found that things fail to link together and work as a co-ordinated whole. Sometimes tinkering with one part of the system can have dramatic repercussions at other parts of the process if the issues are not thought through on a systematic, holistic basis. However, it is also possible to stifle innovation and experimentation if all potential improvements have to be meticulously planned and analysed before their introduction.

Burnes (2004) suggests that the essence of sustainable change is to understand the culture of the organisation that is to be changed. Schein (1996) discusses culture and relates to a lack of alignment and communication between executives, engineers and operators based around his observation that an organisation has three types of culture, each with their own histories and language which are not necessarily compatible. The three cultures described by Schein are the operator culture; an internal culture based on the organisation's operations process, the engineering culture; the designers and technical people who drive the core technologies and the executive culture; the Chief Executive Officer (CEO) and his or her immediate team. An organisational culture is defined by Schein (1996:11) as:
A set of tacit assumptions about how the world is and ought to be that a
group of people share and that determines their perceptions, thoughts,
feelings and to some degree, their overt behaviour.

Schein further refines the general description quoted above and suggests that there are
three levels of culture. The first he describes as being related to the levels of deep tacit
assumptions that are the essence of the culture. The second consists of the espoused
values that often reflect what a group wishes ideally to be and the way it wants to
present itself publicly. And thirdly; 'the day-to-day behaviour that represents a complex
compromise among the espoused values, the deeper assumptions and the immediate
requirements of the situation.' (Schein 1996:11)

In Schein's opinion an organisational culture is based on its history and experiences
and, in established organisations with several decades of success, the culture will drive
the way that the people think, feel and act.

The three cultural levels described earlier, operator, engineering and executive have
difficulty in communicating with each other not only because they could have different
goals and views of the organisation but also, according to Schein, because the very
meaning of the words they use will differ within each group. For example Schein
describes marketing as a concept that has a different meaning to each of these groups,
product development to the engineer, market research to the product manager, and
constant design changes and hassle to the manufacturing manager. This
communication and understanding gap is a cause of much frustration and difficulty when
trying to accomplish goals using cross functional project teams and needs to be
recognised and addressed at an early stage of any project or improvement initiative.

Schein suggests that the operator culture is based around human interaction and that
high levels of communication, trust and teamwork are required to ensure that work is
undertaken effectively at this level. Some of Schein's assumptions of the operator
culture are shown in Table 3.
Table 3: Assumptions of the Operator Culture  (Source: Schein 1996:13)

Assumptions of the Operator Culture

- Because the action of any organisation is ultimately the action of people, the success of the enterprise depends on people’s knowledge, skill, learning ability and commitment.

- The required knowledge and skill are ‘local’ and based on the organisation’s core technology.

- No matter how carefully engineered the production process is or how carefully rules and routines are specified, operators must have the capacity to learn and to deal with surprises.

- Most operations involve interdependencies between separate elements of the process; hence, operators must be able to work as a collaborative team in which communication, openness, mutual trust and commitment are highly valued.

The engineering culture has, according to Schein, shared assumptions based on common education, work experience and job requirements as shown in Table 4. The engineering culture is strongly linked to a background of Taylorism with its focus on scientific management and division of labour, which may be a reason for this drive towards efficiency at the expense of people.

Table 4: Assumptions of the Engineering Culture  (Source: Schein 1996:14)

Assumptions of the Engineering Culture

- Engineers are proactively optimistic that they can and should master nature

- Engineers are stimulated by puzzles and problems and are pragmatic perfectionists who prefer ‘people free’ solutions.

- The ideal world is one of elegant machines and processes working in perfect precision and harmony without human intervention.

- Engineers are safety oriented and overdesign for safety

- Engineers prefer linear, simple cause-and-effect, quantitative thinking

The executive culture is built around the management of the financial survival and growth of the organisation. Schein again defines many of the assumptions of the executive culture in Table 5.
Table 5: Assumptions of the Executive Culture  
(Source: Schein 1996:15)

<table>
<thead>
<tr>
<th>Assumptions of the Executive Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial Focus</strong></td>
</tr>
<tr>
<td>Executives focus on financial survival and growth to ensure returns to shareholders and society.</td>
</tr>
<tr>
<td>Financial survival is equivalent to perpetual war with one’s competitors</td>
</tr>
<tr>
<td><strong>Self-Image: The Embattled Lone Hero</strong></td>
</tr>
<tr>
<td>The economic environment is perpetually competitive and potentially hostile, so the CEO is isolated and alone, yet appears omniscient, in total control and feels indispensable.</td>
</tr>
<tr>
<td>Executives cannot get reliable data from subordinates so they must trust their own judgement.</td>
</tr>
<tr>
<td><strong>Hierarchical and Individual Focus</strong></td>
</tr>
<tr>
<td>Organisation and management are intrinsically hierarchical; the hierarchy is the measure of status and success and the primary means of maintaining control.</td>
</tr>
<tr>
<td>The organisation must be a team, but accountability has to be individual.</td>
</tr>
<tr>
<td>The willingness to experiment and take risks extends only to those things that permit the executive to stay in control.</td>
</tr>
<tr>
<td><strong>Task and Control focus</strong></td>
</tr>
<tr>
<td>Because the organisation is very large, it becomes depersonalised and abstract and, therefore, has to be run by rules, routines (systems) and rituals ('machine bureaucracy')</td>
</tr>
<tr>
<td>The inherent value of relationships and community is lost as an executive rises in the hierarchy.</td>
</tr>
<tr>
<td>The attraction of the job is the challenge, the high level of responsibility and the sense of accomplishment (not the relationships).</td>
</tr>
<tr>
<td>The ideal world is one in which the organisation performs like a well-oiled machine, needing only occasional maintenance and repair.</td>
</tr>
<tr>
<td>People are a necessary evil, not an intrinsic value.</td>
</tr>
<tr>
<td>The well-oiled organisation does not need people, only activities that are contracted for.</td>
</tr>
</tbody>
</table>

One of the main issues, according to Schein, is that as managers rise in the organisation they become more impersonal because as their span of control increases they reach a position where they are no longer managing operators but other managers who think like they do. Thus Schein observes that the engineering and executive cultures view people and relationships as a means to achieving efficiency and productivity not as ends in themselves.

Schein then discusses the dysfunctional interactions among the three cultures and suggests that when these three cultures do not work together in harmony, there is frustration, low productivity and the failure of innovations to survive and diffuse. He suggests that there must be mutual understanding between the three cultures to develop
solutions that will be understood and implemented in order for there to be alignment. In conclusion Schein emphasises that organisations must:

- take the concept of culture more seriously than we have.
- find ways of achieving better communication across cultural boundaries.
- create cross-cultural dialogue.

This section has discussed typical issues that inhibit sustainability during a change process. A summary of the main issues identified includes:

- Introducing the latest fad, because it is fashionable but with no long term plan
- Introducing too many initiatives with no clear strategy or direction
- Introducing an improvement initiative and expecting instant success
- A failure to integrate improvements into the business process
- Conflicting organisational policies
- Failing to address or even consider cultural issues
- No clear process for the selection, implementation and sustainability of an improvement initiative

With the current pressures for ongoing improvement the consequences of failure can be at best costly at worst fatal for an organisation. Consideration of the issues identified may help to increase sustainability of an initiative. The next section will look at strategy and investigate further the argument that there is a fragmented approach to the development and implementation of strategy.

2.1.3 Strategy

In section 2.1.1 it was proposed that the approach to organisational change was fragmented and that there was a lack of cohesion between long term planning and thinking and operational planning and implementation. It was also suggested that there was no clear organisational or performance improvement change process that encompassed both long range planning and shorter term operational activity or planning (Fig. 4). This section looks at the role of strategy and investigates further the argument of an incomplete strategic approach to performance improvement. However, before
investigating these issues it is useful to find out what strategy really is and how it is formulated.

The development of strategy and strategic management has been a topic of interest to academics and business practitioners since the mid sixties. Interest in strategy and the strategic planning process has moved through a number of phases – from planning and strategy formulation to more recently a focus on strategic leadership. Chandler (1962) was one of the earliest writers on strategy and he suggested that strategy was the determination of the long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for reaching those goals.

Hayes (1984) expressed concern that the term strategy had been overused and that its unique meaning (derived from the Greek military term strategos, meaning, literally "the general's art") had been lost when applied to the practice of management. He re-emphasised the definition of strategy as establishing purpose, setting direction, developing plans, taking major actions and securing a distinctive competitive advantage.

Garrett (1996) related to a simple three-level hierarchy in organisations, which the Chinese have used for over 5000 years, and which the Greeks evolved some 1,500 years later as:

- Policy
- Strategy
- Tactics/operations

Strategy, he suggests is contrasted to tactics, which are a specific scheme for employment of allocated resources, and also with policy which was defined by Ansoff (1988) as a contingent decision whereas strategy is a rule for making decisions. In business practice applications the term policy is often used interchangeably with strategy.
Many strategic-planning processes confuse strategy with planning, according to Campbell and Alexander (1997). They explain that plans exist to cope with the immediate needs of the organisation and operate under a preset timetable and demand structured documentation. Although they agree that planning is a valuable activity and is unfairly derided, they also indicate that it is a different process from forming strategy. However, to add to the confusion, Skinner (1969) defines strategy as a set of plans and policies by which a company aims to gain advantages over its competitors.

Hax (1990) suggests that a simple definition of strategy is not easy. He indicates that in order to clarify the definition process then it is necessary to consider the concept of strategy separately from the process of strategy formulation.

Hayes (1984) refers to levels of strategy, Figure 7. At the highest level the corporate strategy is defined. The second level is the strategic business unit (SBU). This level specifies the scope of the business and links to the corporate strategy. This is then followed by the third level, for each SBU, which is defined as the functional level.

Figure 7: Levels of Strategy
(Hayes 1984, reproduced from figure 2-1, p.28)
The process described above requires separate strategies to be developed by different management teams at each level – with the expectation that the strategies will be congruent and cohesive. It was indicated in section 2.1.1 that for effective performance improvement the strategy should be developed as one cohesive strategy by the management team working together as a unit. This indicates that strategists must resist the temptation to view operational, business and corporate strategy issues in isolation.

What is clear from the literature is that there is no one, accepted, clear definition of strategy. What appears to be generally agreed is that strategy is usually a long-term approach to the shape and direction of the business and is the responsibility of the Senior Management team.

Many conflicting opinions have also been expressed regarding the process used to formulate strategy and this is not surprising considering the difficulty in agreeing what strategy really is. Hamel and Prahalad (1994) are concerned that strategy has lost much of its credibility, as most strategic planning is strategic in name only, being ritualistic and formulaic, seldom deeply creative.

Again there appears to be a conflict of opinion. Campbell and Alexander (1997) suggest that strategists fall into three camps, those who focus on operating issues, those who focus on gazing into the future and those who focus on behaviour and culture. Some strategists are members of more than one camp, although they often exhibit a strong bias toward one of the three approaches.

Mintzberg and Waters (1985) defined two approaches to strategy formulation, intended strategy and realised strategy. Intended strategy is defined as a pattern of decisions whilst realised strategy is a pattern of actions. Where realised strategies were fully intended, Mintzberg and Waters speak of deliberate strategy but they also argue that realised strategy can come about despite the absence of intentions and they refer to this as emergent strategy. This distinction between deliberate and emergent strategy goes to the heart of the debate on strategy formulation and the crucial issue, from an
academic perspective, is whether strategy formulation should be more deliberate or more emergent. The two opposing views on this are illustrated by the logical, planning perspective and the messy, fragmented, incrementalism perspective. It is likely, and probably advantageous, from a practical perspective, that most strategic formulation processes combine elements of both perspectives.

Whether the approach to performance improvement is planned or emergent it needs to fit the requirements and needs of the organisation. The concept of a sustainable improvement model that enables organisations to develop their strategic approach to change is an attractive one.

Most discussions of strategic planning focus on how to formulate strategy, whether through a deliberate or emergent process, as described above. However, it has also been recognised that problems with implementation have resulted in failed strategies and abandoned planning efforts. Toone (1999) emphasises this by suggesting that strategy is about creating the future but it is also critical that the strategy includes a plan for implementation. The methods and problems of strategy implementation have received less attention than have those of strategy formulation even though both practical and academic experience indicates that decisions made in implementing strategy have a substantial impact on organisational performance. There appears to be no unified, logical, normative approach for implementing strategy. (Hrebiniak & Joyce, 1984).

Thompson, (2001) argues that it is possible to view implementation as an activity which follows strategy formulation – structures and systems are changed to accommodate changes in strategy. However, implementation instead of following formulation may be considered in depth at the same time as the proposed strategy is being developed and before final decisions are made. This is more likely to happen where several managers, especially those who will be involved in implementation, are consulted during the strategic development process.
Ansoff (1988), considers the application and implementation of the strategy and emphasises that the results of strategic planning are often difficult to translate into practice. Strategies must be implemented if they are to be successful and effective. Kanter (1989) points out that we need to respect the process of implementation as well as the substance of what is implemented. Quinn (1993) argues that the hardest part of strategic management is implementation and Thompson (2001) points out that as no single evaluation technique can select a best strategy then similarly there is no one best way of implementing strategic change. Bourgeois and Brodwin (1983) describe five approaches to implementation but conclude by suggesting that the choice of method should depend on a number of factors including, the size of company, the degree of diversification, the degree of geographical dispersion, the stability of the business environment and the managerial style currently embodied in the company's culture.

So what can be concluded from this short discussion of strategy? Although providing a simple definition of strategy is not easy, it is generally accepted that an effective strategy should provide a sense of unity, direction and purpose as well as a plan or process for implementation and a means of facilitating the many changes that could be required by an organisation. There needs to be a readiness to change within the organisation and the ability to implement the proposed changes. Strategy and strategic planning can be described as the process of moving a corporation from some existing level of success and state of competitiveness to a future desired level. In a nutshell strategy is doing the right things for the right reasons.

2.1.4 Developing the Research Aim and Questions

The literature review has developed a clearer understanding of improvement processes and recognised that many organisations are under significant pressure to improve. Sections 2.1.1 and 2.1.2 identify a number of weaknesses that occur when organisations implement performance improvement and argues that there is a need for a more complete approach. Section 2.2.2 identified issues that inhibit the sustainability of an improvement programme such as the need to embrace a range of factors including the organisational setting and the organisation's culture and policies. The section on
strategy recognised that problems with implementation have resulted in failed strategies and abandoned planning efforts and it was acknowledged that an effective strategy should provide a sense of unity, direction and purpose as well as a plan or process for implementation.

This research has provided essential information to help define and develop the research questions. Before developing the research questions and research aim the practical and conceptual problems need to be considered and discussed. These will be introduced in Sections 2.1.4.1 and Section 2.1.4.2. Section 2.1.4.3 will discuss and develop the research questions and research aim. An overview of this section and the logic behind the approach is shown in Figure 8.

![Diagram](image)

**Figure 8: Approach Used to Develop the Research Aim and Questions**

### 2.1.4.1 The Practical Problem

This section provides details of the practical problems that have been identified. A practical problem originates and exists in the real world and according to Booth, Colomb and Williams (1995); is solved by doing something. A practical problem exacts a cost in terms of money, time, happiness and market share. The practical problem identified through the literature search is discussed below.
The pressures on organisations to improve, or even maintain their current state of performance, are becoming more and more intense. Many organisations are, not surprisingly, struggling to keep pace. Businesses are making efforts to improve through the introduction of new initiatives, but many of these improvements often either fail completely or succeed in the short term and are not sustained. The improvement then dies, often after much expenditure and in many organisations the search for the next improvement tool or technique takes place. The search for the next improvement method is becoming more and more difficult as there are now so many tools and techniques available that organisations are becoming confused and jump on the latest panacea or fad bandwagon as a way of reacting to pressures to improve. This never-ending process of virtual improvement becomes a vicious cycle which is illustrated in Figure 9. This vicious cycle often results in de-motivated employees who are constantly trying to come to terms with a search for yet another new fad and is costly in terms of employee and management morale, time and investment. One solution could be a model that will help to select and introduce an appropriate improvement process for the organisation.

![Figure 9: The Search for Improvement](image-url)
Thus, the practical problem is that improvement initiatives are introduced at great cost and fail to produce the benefits that are expected, and also, fail to be sustained and integrated into normal, day-to-day, business processes or operations.

2.1.4.2 The Conceptual or Research Problem

Research problems involve what we don't know or fully understand. Research problems, according to Booth, Colomb and Williams (1990) originate in the mind out of incomplete knowledge or flawed understanding. This section identifies the core research problem or conceptual gap in order to respond to the practical issues described earlier and to provide further information that will enable the research questions and research aim to be developed.

The secondary research reported in the earlier sections of this chapter indicated that many initiatives are introduced as either responses to difficult situations, or crises, or even because they appear to be fashionable, a get the latest acronym now syndrome. There appears to be a lack of strategic thinking and planning related to what is right for the organisation and how a particular solution can be fully integrated into the culture and objectives of the organisation. It is a case of let’s look for the latest initiative which will save us approach rather than thinking through the organisational needs and objectives which may require more intense commitment to current improvement mechanisms and doing them properly. There is little evidence of a cohesive management team approach to organisational performance improvement that combines the long term strategic plan with a strategy for implementation and also considers the three levels identified in Figure 1 and discussed in section 2.1.

Short-term solutions may, of course, be justifiably introduced to solve day-to-day issues and can be very useful and powerful. However, when reactive management and fire fighting become the norm these short-term initiatives are often introduced at the expense of longer term more difficult to introduce improvements. The organisations, which will survive and thrive in the new millennium, are those that can strike a balance between short-term reactive responses and longer term strategic improvements.
The conceptual gap is that there appears to be a lack of thinking and strategic planning based around the real improvement needs of an organisation and how to introduce and integrate appropriate initiatives, which will deliver sustainable improvement.

2.1.4.3 Research Aim and Questions

The research questions are critical as they help to set priorities, add focus and determine the overall scope of the study. The previous sections within this chapter have developed and identified the practical and conceptual gap. This section will determine the precise research questions and overall research aim that will be the focus of this study.

This research primarily focuses on the management of organisational change and more specifically performance improvement and the need to implement and sustain the process of improvement. In the context of this research, sustainable improvement is recognised as an organisational approach that drives and facilitates both continuous improvement and step change and is fully integrated into the establishment's systems and procedures. The research will attempt to provide solutions to two main areas of concern. Firstly, the selection of appropriate improvement initiative/s or process for an organisation and secondly, the integration and sustainability of these initiatives. To address these concerns the following research questions have been developed.

Research Questions

1. Is it true that organisations introduce too many initiatives many of which fail to produce the benefits for which they were originally introduced?

2. What are the factors that influence the success or failure of an initiative?

   2a. What are the reasons for the success of improvement initiatives?
   2b. What are the reasons for the failure of improvement initiatives?
   2c. What factors need to be established or present when an improvement initiative is introduced that will make it more likely to be a success?
   2d. What factors need to be established or present when an improvement initiative is introduced that will make it more likely to be sustained?
3. Are management failing to take a strategic and planned approach to the introduction and sustainability of improvement initiatives?

Following the development of the research questions the research aim was identified as follows:

Research Aim:
The overall aim of this research is to develop a model that can be used by manufacturing organisations to improve the success and sustainability of performance improvement initiatives.

Thus, to summarise, the outcome of this section was that this research would attempt to develop a model which can be used by manufacturing organisations to assist them to select, implement and integrate appropriate processes or improvement tools in order to achieve measurable, sustainable performance improvement.

2.1.5 Conclusion
Chapter 1 and section 2.1 have illustrated the growing complexity and diversity of initiatives and change mechanisms, which are being offered as 'the solution' and are sometimes adopted by organisations. It has also referred to the difficulty of breaking out of old established paradigms - such as the Taylor model - and introducing real sustainable performance improvement.

Taylor's scientific approach (Taylor, 1911) has led to an over reliance on a process focused approach to performance improvement. One of the arguments proposed in this section is the need for an approach to performance improvement that fully considers the three levels identified in Figure 1, strategy/leadership of the organisation, organisational context and as discussed above, process focused. Typically strategists or strategic planning often exhibits a bias towards one of the three approaches and fails to fully consider the other levels. It was also suggested that management teams need to
consider a broader range of factors, Figure 2, to ensure success and sustainability of performance improvement. It is suggested that any process based model that is developed will need to consider these factors.

A taxonomy of improvements was developed (Figure 3) in an attempt to put improvement tools and methodologies into an understandable context. The taxonomy of improvements will help to improve understanding of where these improvement techniques fit within an organisation's performance improvement programme.

Finally an important concept is that improvement work tends to develop as a parallel structure from normal day to day work rather than becoming an integral part of the organisations systems and procedures. This is the basis of Research Question 3, which questions management's ability to take a strategic and planned approach to the development, implementation and sustainability of improvement initiatives.

The practical and conceptual gaps and subsequently the research questions and research aim have been developed. The development of the research questions and research aim has provided a solid base from which to develop the methodology to be used to carry out the primary research. The next section researches further literature to support the development of the model.
2.2: BACKGROUND TO THE MODEL

2.2.1 Introduction

This research is set within the context of technology and has been undertaken with the intention of producing something that should be of practical use rather than just a quest for knowledge. The development of the model is an attempt to satisfy this requirement and this section concentrates on the research and analysis of further information that will support the development of the model. Five areas are discussed as follows:

2.2.2 Errors and Assumptions

2.2.3 Good Practice

2.2.4 Culture

2.2.5 Processes and Pathways to Change

2.2.6 Performance Measures

The final sections summarise the main points researched in this chapter. Chapter 6 explains the development and testing of the model.

2.2.2 Errors and Assumptions

This section introduces typical errors that occur and assumptions that are often made when attempting to implement a change initiative. Kotter (1995) discusses eight problems, referred to as errors that he identified during his research on why transformation efforts fail.

Error 1: Not establishing a great enough sense of urgency

When the urgency rate is not high enough or if, according to Kotter, a minimum of 75% of management is not honestly convinced that business-as-usual is totally unacceptable, then it is likely that serious problems can be encountered later on in the improvement process.
Error 2: Not creating a powerful enough guiding coalition
Kotter emphasises that if there is not a group of influential people, which includes senior management to monitor and drive the improvement process then failure will eventually occur.

Error 3: Lacking a vision
Without a clear, sensible vision, Kotter suggests that a transformation effort can dissolve into a series of incompatible projects and initiatives that lead nowhere.

Error 4: Under communicating the vision by a factor of 10 (or 100 or even 1,000)
Kotter suggests that change is impossible without the help and support of the workforce and to capture their hearts and minds, communication is essential. He implies that not only is the wrong message often communicated (behaviour vs. words) but the communication process itself can be under communicated by a factor of at least ten and sometimes far higher.

Error 5: Not removing obstacles to the new vision
A failure by management to help people to overcome barriers through encouragement, support, consistent action and measurable progress can contribute to the collapse of an improvement programme.

Error 6: Not systematically planning for and creating short-term wins
Kotter believes that change programmes will lose momentum if the workforce cannot see progress towards the end result and have the opportunity to celebrate the achievement of short-term goals.

Error 7: Declaring victory too soon
Kotter believes that declaring victory too early can allow the pressure to ease and the real goals may not be achieved so it is important that victory is not declared until the original goals and targets have been accomplished.
Error 8: Not anchoring changes in the corporation's culture

Until a change initiative becomes a way of life then Kotter suggests that the change process is not complete. This correlates to Lewin's third stage of his model — refreezing (Lewin, 1951). Similarly, Gilbert (1995) suggests that once an improvement has been identified and proven, there needs to be a means of ensuring that it is maintained.

Caparelli (1996) argues that management often make a number of false assumptions, which can prevent a change effort from even beginning. These are:

- A company's vision for change will automatically inspire all its employees
- The creation of a new mission, vision, or strategic statement will (in itself) precipitate significant change.
- Employees know intuitively how to produce desired results quickly.
- Resistance to change can be overcome by intimidation and force.
- The value of the change effort is obvious to everyone.

The results of a survey conducted in 1994 by Coopers & Lybrand L.L.P. (C&L) in conjunction with the American Society for Quality Control (ASQC), the Rutgers University Centre for Public Productivity and the National Quality Institute of Canada which examined 300 leading organisations across 15 industry sectors showed some fundamental differences in commitment and approach between high performing and lower performing organisations (Yearout, 1996).

In lower performing organisations the hands on involvement of the CEO and first level supervisors was not as apparent as in high performing organisations. The survey confirmed the regular communication of the vision and strategy by the CEO, first-line supervisors and others in higher performing operations. Employees in these organisations were more likely to understand the need for change and were more likely to be provided with the skills and expertise to undergo the change than those in lower performing organisations. In top performing organisations employees had a greater understanding of the link between their tasks and the organisation's strategic plans and
goals than in lower performing organisations. In lower performing organisations there was evidence of little or no linkage between employees' and the organisation's goals.

The commitment to continuous process improvement was not a core competence and operating feature of lower performing organisations. Finally, high performers were found to be more conscious of the importance of using multiple measures of performance, typically quality, cost and time, to assess organisational performance, than lower performing organisation.

A number of reasons that contribute to failure of an improvement programme were identified in this section. Many of these 'errors' were also confirmed by the case studies reported in Chapter 5. The next section looks at examples of good practice that can help to successfully implement and sustain a performance improvement programme.

2.2.3 Good practice

The previous section looked at some of the errors that are typically made when attempting to introduce and sustain an improvement initiative. This section will identify and discuss examples of good practice from further secondary research into organisational change programmes.

The main lesson to be learned, according to Kotter (1995), is that the more successful business transformations go through a series of phases that require a considerable length of time. Subsequently he developed eight steps for successful business transformation, which are reproduced in Table 6 (Kotter, 1996). The eight steps although simplistic in their individual descriptions are complex in terms of the evaluation and measurement of their degree of implementation. Kotter emphasises that the eight stage process is a series of steps that must be followed in a logical sequence to maximise the opportunity for success. 'Skipping even a single step, without first consolidating any change, almost always creates problems' (Kotter 1996:23).
Table 6: Eight Steps for Business Transformation (Kotter 1995: 61)

1. Establishing a sense of urgency
   Examining market and competitive realities
   Identifying and discussing crises, potential crises, or major opportunities

2. Forming a Powerful Guiding Coalition
   Assembling a group with enough power to lead the change effort
   Encouraging the group to work together as a team

3. Creating a Vision
   Creating a vision to help direct the change effort
   Developing strategies for achieving that vision

4. Communicating the Vision
   Using every vehicle possible to communicate the new vision and strategies
   Teaching new behaviours by the example of the guiding coalition

5. Empowering Others to Act on the Vision
   Getting rid of obstacles to change
   Changing systems or structures that seriously undermine the vision
   Encouraging risk taking and non traditional ideas, activities and actions

6. Planning for and Creating Short-Term Wins
   Planning for visible performance improvements
   Creating those improvements
   Recognising and rewarding employees involved in the improvements

7. Consolidating Improvements and Producing Still More Change
   Using increased credibility to change systems, structures and policies that don't fit the vision
   Hiring, promoting and developing employees who can implement the vision
   Re-invigorating the process with new projects, themes and change agents

8. Institutionalising New Approaches
   Articulating the connections between the new behaviours and corporate success
   Developing the means to ensure leadership development and succession

Step 1: Establishing a sense of urgency

Kotter indicates that creating a strong sense of urgency requires effective leadership and possibly taking bold or risky actions. He provides suggestions, some of which are very risky, to raise the urgency level such as 'creating a crisis' and 'setting very challenging performance targets' (Kotter 1996, Exhibit 2, p 44).

Caparelli (1996) also recognises the need to raise the urgency level. He suggests that senior managers often believe that everyone in the organisation will share their views, energy, dedication and commitment to achieving the desired results and will support the change effort. Caparelli bluntly states that 'nothing could be further from the truth.'

Step 2: Forming a powerful guiding coalition

Building a powerful guiding coalition (or a committed team) that can implement and sustain an improvement initiative is the second of the eight stages identified by Kotter. Unfortunately, many senior managers worked in an era when teamwork was uncommon
and they fail to see the justification or benefits. This failure to recognise the need for an effective team can result in lost opportunities because as Belbin (2001:169) suggests, 'no one is perfect but a team can be...'

An effective team needs both leadership and management skills. Management is required to control the process whilst leadership is necessary to inspire the team members and drive the change. Bennis and Goldsmith (1997) define a leader as someone who has the capacity to create a compelling vision and can take the people towards that vision by translating the vision into action. However, developing leaders and leadership is not straightforward and commonplace. (Macoby, 1997:170)

A cautionary note at this juncture is to consider whether the concept of a team based approach is a bolt-on piecemeal solution for every organisation. It is possible that a team approach will not work for every organisation; however, the case studies illustrated the difficulty of sustaining an improvement initiative without the commitment of the management team.

**Step 3: Developing a Vision and Strategy**

The third step advocates the need to develop a vision and strategy. Kotter (1996:68-70) suggests that a clear vision fulfils three important purposes in that it:

- Clarifies the general direction for change and thus simplifies hundreds of complex decisions.
- Motivates people to take action.
- Co-ordinates actions to a common goal in a fast and efficient way.

An effective, well-constructed vision can give clarity of direction and help to move employees out of their comfort zones and support sustainable change. An effective vision requires clarity and ambitious, but realistic goals and needs to appeal to the majority of stakeholders in an organisation. (Kotter 1996, EXHIBIT 3, page 72)

Creating an effective vision can be difficult remembering that the goal is to direct, align and inspire action. Bennis & Goldsmith (1997) describe a vision as a portrait of the future to which everyone can commit. Collins and Porras (1999) suggest that a well
conceived vision consists of two major components – core ideology and an envisioned future. A good vision builds on the interplay between these complementary forces; it defines what we stand for (the core purpose or ideology) and what we are aspiring to achieve (the envisioned future).

The need for an effective strategy to complement the vision is critical. The strategy must provide a logical approach together with a fundamental level of detail that will show how the organisation can move towards the accomplishment of its vision. As discussed previously the requirement is for a strategy that embraces implementation and sustainability of an improvement initiative.

Senge (1999) points out the importance of handling strategic decisions effectively and emphasises that organisations that can handle and utilise strategic questions that bubble up from within can tap into a source of energy, creativity and responsibility unavailable in more traditional organisations. However, top management has to take responsibility for the final crafting of the strategy and ensuring that it is driven or deployed through the organisation, suggesting a mix of an emergent and planned approach to strategy development.

Drucker (1995) suggests that a fundamental shift is arising as leaders come to understand strategy. Strategy or the development of strategy is a mechanism for not only planning and theorising about the direction of the business but is a means to release the energy and creative juices within an organisation and to help start and energise the change programme. Senge (1999:372) reinforces this view by suggesting that the most promising strategies help people at different levels look at the future of the business together, to educate each other, and to increasingly appreciate each other’s aspirations and dilemmas.

The development and use of a strategic process is no simple matter and is one that has been discussed by leading academics and writers for many years. One of the most influential of these was Mintzberg (1994) whose main concerns were that the strategy
process was a planned, structured programme lacking in creativity and imagination and often a numbers game whereas the implementation process was more fluid and open. He believed that this was exactly the opposite of what was required. He suggested that:

..the reality of strategy making would seem to be exactly the opposite:
formulation should be the open ended, divergent process (in which imagination can flourish in the creation of new strategies) while implementation should be the closed-ended, convergent one (in which these given strategies are subjected to the constraints of operationalisation)
Mintzberg (1994:60)

Hamel (1997), like many others, notably Senge, Drucker and Mintzberg, has also recognised the need for strategy development to become more convincing and to encourage participation from a broader spread of people in an organisation other than just the executive management team. Strategy creation must be a deeply participative undertaking involving a broad range of people from many levels of an organisation. This concurs with much of what Mintzberg (1994) had suggested when he referred to the emergent, rather than the planned approach to strategy development.

Clearly, strategies, policies, structures and processes need to be aligned and pulling in the same direction and be congruent with the company's vision. It is also important that the organisation can cope with continually changing circumstances. To support this requires a management team and a workforce that is flexible, focused and empowered.

**Step 4: Communicating the change vision**

The power of a clear, meaningful vision and strategy is only realised when a majority of the employees in an organisation have a clear and common understanding of its goals and direction. Communication of the vision and the strategy is a vital aspect of the change process.

Kotter (1996) suggests that the process of communicating effectively with large numbers of people requires more than just passing on a message. It requires investing enough time and effort, through ongoing dialogue, discussion and action, by all the management
team with as many employees as possible. The challenge is to keep the message simple and clear.

Step 5: Empowering Employees for Broad Based Action

This step emphasises the importance of empowering employees for action. Empowerment is about giving people, at all levels in an organisation, the ability and the authority to make decisions. Gilgeous (1997:306) describes empowerment as:

leadership that devolves responsibility and control to employees to take personal responsibility for the way they do their jobs. People are recognised as an asset to the company and encouraged to fulfil their potential while at work.

Recognising people as an asset is a culture change for organisations that base their management style on Taylorist principles of control. Peters (1987) indicated that one of the main reasons for organisations failing to become World Class was the reluctance and inability of management to tap into their workforce's potential.

Kotter (1996) indicates that the true purpose of Step 5 is to empower a sufficient number of employees to take action and help to remove as many of the barriers to the implementation of the change as possible.

Empowerment and a bottom up approach is not the solution to all organisational problems according to Strebel (2000). He discusses certain environments, which for cultural reasons, or a lack of experience and training, may not be capable of handling a bottom-up approach to improvement. What is really required is an approach that fits the organisation. This is an important point, which is often not considered when a specific improvement initiative is introduced through its proven path or recommended implementation process.

This fifth step has suggested that empowering people for broad based action is a necessary step in successfully changing an organisation. However, the evidence from the case study work shows that empowering the people might be a necessary step in introducing an improvement or in other cases it might not. The cellular manufacturing
case study at Ortho Clinical Diagnostics (section 5.3) was a good example of introducing a successful initiative without initially empowering the shop floor team. The impetus for the initiative came from the top management team, who delegated responsibility for implementation to the project team. The initiative was set up, developed and introduced by the project team. The shop floor employees were involved in the process after it had been set up and developed and were encouraged to work with the new system. They were not empowered to contribute to the initial development of the cell. It was left to top management and the project team to identify further changes and improvement opportunities. As explained, the initiative proved to be very successful, and sustained which justified the implementation process used.

Step 6: Generating Short Term Wins

In order to support ongoing sustainability, Kotter suggest that it is useful to build in shorter-term opportunities to celebrate success through short-term achievements. It is important to make sure that the short-term gains are not regarded as finished activities but as part of the long-term programme. Planned reviews against relevant performance measures where genuine success can be recognised can help to justify the overall investment that may be required. Celebrating short-term success can help to sustain motivation and help to undermine cynics as real improvements make it more difficult for them to resist change and may help to bring them on board. As Chang (1995:14) indicates:

Achieving measurable improvement results early on ....... is crucial to sustaining a quality improvement initiative and building long-term implementation success.

Step 7: Consolidating change and producing more change

The previous step discussed the generation of short-term wins and their associated benefits. This step ensures that one of the main pitfalls when generating short term wins - complacency - is avoided and that change is not just consolidated but also used as a lever to generate more change. Effective leadership is fundamental to this step as is long term vision, determination and the ability to win hearts and minds.
Step 8: Anchoring New Approaches in the Culture

The eighth step of Kotter's transformation process is related directly to the concept of sustainability. The requirement is to ensure that the new style of operating is firmly grounded in the organisation's culture. Understanding culture and its effect on sustainability is a fundamental issue and culture is developed in more depth in Section 2.2.4.

Gilbert (1995) proposes a framework for sustainable development based on six concepts, which she suggests will optimise the achievement of sustainable improvement.

Table 7: A Framework for Sustainable Development

- a focus on the key issues, usually obtained through some type of policy deployment;
- integration of improvement activities into the overall business plan;
- a self-assessment process against criteria such as the Australian Quality Award or Baldridge; (or the European Quality Award in Europe)
- a framework or quality system to enable the gains to be held
- a performance measurement system to show that progress is being made
- training which is carried out 'just-too-late' so that trainees have motivation to learn.

(Gilbert 1995: 38)

Gilbert points out that improvement activities should be integrated into the business plan and that it should be described as the 'way you manage' and not be given a specific name or title. This concurs with much of the literature that indicates that once an initiative is labelled then it becomes just that - an initiative. It became more evident as this research developed that initiatives are a means or a mechanism to improvement that should possibly fit under a common umbrella, or a taxonomy of improvement (Fig. 3). Gilbert supports this view by acknowledging that:

The most successful organizations are those in which TQM is not promoted as a programme and the strategies are integrated and deployed through the business. The majority of Australian Quality Award winners have integrated their strategies into their business plans and used TQM techniques or systems to support them, rather than building their strategies around a high profile programme.

(Gilbert 1995:40)
One of the outcomes of the case study research supports Gilbert's fifth assertion that a performance measurement system that links mission, vision and values through to the planning process and the performance indicators is required to ensure ongoing improvement. The indicators required vary depending on the type of industry and the achievements being pursued. However, Gilbert makes a significant point when she states that it is the constancy of purpose that is being evaluated.

Another model for change, suggested by Gilgeous (1997), has three phases of intervention which are shown in Figure 10.

![Flowchart of Intervention Model](image-url)

**Figure 10: Basic Stages of the Intervention Model.** (Gilgeous 1997, Fig 1.4)

The definition stage of Gilgeous' model involves an in-depth specification and study of the change situation, both from a historical and futuristic view. This corresponds to what can be described as the diagnostic stage. The evaluation phase generates and evaluates the potential options and the implementation stage develops the action plans and attempts to identify the improvement tools and techniques or processes required. Gilgeous emphasises that during each of the stages it is essential to continually measure and monitor progress and to take the necessary corrective actions.

Gilgeous suggests three basic approaches to implementation; pilot studies; parallel running and Big Bang. Pilot studies provide an opportunity to review the change in a relatively safe way and possibly help to develop a better approach. However, pilot studies delay full implementation. Gilgeous suggests that it must be appreciated that the environment does not stand still and the use of a pilot approach could be counter productive as it provides more time for those who may wish to resist the change. On an opposite note, a pilot study, which succeeds in achieving its objectives, can be a powerful mechanism and means for achieving change and winning top-level commitment to the change. A pilot study can also be a useful learning mechanism for the people involved and the management team at relatively low risk and low cost.

When the proposed changes can greatly affect other areas, Gilgeous suggests that it may be best to adopt a parallel-running implementation strategy and slowly phase out the old system, as the new becomes more reliable and understood. His third approach, 'Big Bang' implementation maximises the initial impact and speed of change but it can also generate the maximum resistance, at least in the short term.

The final stage of the implementation process is the stage which is often neglected and found to be the most difficult to integrate or fulfill in most organisations. This is sustainability or what Gilbert calls consolidation. This stage will fail completely if the previous stages have not been developed logically and with the concept of sustainability in mind.
This section has discussed and analysed examples of good practice through a review of appropriate literature and referral to the case studies from Chapter 5. Three models were discussed; Kotter’s eight steps for business transformation (Table 6); Gilbert’s framework for sustainable development (Table 7) and Gilgeous’ basic stages of an intervention model (Figure 10). The models provide background information for an initial framework and possible steps towards a sustainable improvement model although they are weak on how to implement the improvement. It is also noticeable that there is little discussion or recognition of the need to understand and work with the culture of an organisation when introducing an initiative. The next section will address the issue of culture and discuss its importance to the implementation of an improvement initiative.

2.2.4 Culture

Section 2.2.3 introduced and discussed examples of process models that can assist in the implementation of business improvement programmes. Section 2.2.3 concentrated mainly on the process rather than the ‘softer’ factors, such as culture, of a performance improvement programme.

This section discusses organisational culture and considers its importance and influence on a change programme. The need to consider a broader approach to performance improvement was highlighted in section 2.1 and more specifically Figure 1 which explained the importance of considering three levels, one of which was described as the organisational context or setting. Culture is an important characteristic of the organisational setting and this section attempts to identify how culture will affect the success and sustainability of a performance improvement process. The study of organisational culture is by no means a new one, for example Potter quotes Jacques (1951) as defining the culture of an organisation as the:

customary and traditional way of thinking and doing things, which is shared to a greater or lesser degree by all its members, and which new members must learn, and at least partially accept, in order to be accepted into service in the firm........

(Potter 1989:17)
Much of the work on culture and structure goes back to Burns and Stalker (1961), and their influential book, 'The Management of Innovation'. The 3rd edition of this pioneering work was released in 1994 (Burns and Stalker, 1994). The book presents the authors' classification of mechanistic and organic systems of management. Mechanistic systems were defined as being appropriate to organisations operating under relatively stable conditions. The other, organic, appeared, according to Burns and Stalker, to be required for conditions of change.

Burns and Stalker discovered that organic systems adapted to unstable conditions where activities and roles could not be distributed within a clearly defined hierarchy. Individuals performed tasks according to their knowledge whilst communication tended to be lateral rather than vertical command. The organic system relies heavily on the knowledge and commitment, or empowerment, of the individual as Burns and Stalker (1994:122) observe:

...it is an essential presumption of the organic system that the lead, i.e. 'authority', is taken by whoever shows himself most informed and capable, i.e. the 'best authority'.

Burns and Stalker emphasise that the two forms of system, mechanistic and organic, represent a polarity not a dichotomy as intermediate stages between the extremities were identified during their research study. They observed that there was a succession of adaptive shifts from one system to another and that these were often uncontrolled, unpremeditated movements, sometimes moving towards an organic system and sometimes going into reverse. The culture of the organisation appeared to evolve and change slowly over time. However, when implementing an improvement programme this adaptation of culture is usually too uncontrolled and too slow to have the required influence. The question then arises as to whether changes in organisational culture can be managed and potentially changed more quickly. Wilson (2001:354) suggests that

More and more researchers began to employ culture as a variable rather than a 'root metaphor', something an 'organisation had' versus something 'it was'.
The consensus of opinion is moving towards believing that culture can be managed and changed, however this may not be easy. What is less clear is whether this change of culture is at the visible, behavioural level or at the deeper, less visible level defined by Schein (1985). He believes that deeper levels of culture change are possible, but the process might not be as straightforward as many managers or academics believe.

Wilson (2001) suggests that there are many definitions of culture, ranging from simple descriptions such as the 'feeling in the organisation', to the 'rules of the game' and to 'how things are done around here' to more complex and all-embracing definitions produced by Schein (1997), Schneider (1988) and Kotter and Heskett (1992) as:

A pattern of basic assumptions, invented, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration - that has worked well enough to be considered valid and therefore, to be taught to new members as the correct way to perceive, think and relate to those problems.
(Schein 1997:9)

Culture refers to (a) the values that lie beneath what the organisation rewards, supports and expects; (b) the norms that surround and/or underpin the policies, practices and procedures of organisations (c) the meaning incumbents share about what the norms and values of the organisation are
(Schneider, 1988:353)

At the deeper and less visible level, culture refers to values that are shared by the people in a group and that tend to persist over time even when group membership changes. At the more visible level, culture represents the behaviour patterns or style of an organisation that new employees are automatically encouraged to follow by their fellow employees. Each level of culture has a tendency to influence the other.
(Kotter and Heskett, 1992:4)

The majority of authors, according to Wilson, believe that there are two levels of culture. Firstly, the visible level that encompasses behaviour patterns, the physical and social
environment and the written and spoken language used by the group. And secondly the
deep level that refers to the group's values and what Schein calls their
shared basic assumptions.

Handy (1983) proposes that organisations have their own set of differing cultures,
declared as sets of values and norms and beliefs which are reflected in different
structures and systems. The cultures are, according to Handy (1983: 176)
affected by the events of the past and by the climate of the present, by the
technology of the type of work, by their aims and the kind of people that work in
them.

Handy defines culture as a pervasive way of life, or set of norms. He introduces four
different cultures: power, role, task and person. Handy explains that a power culture is
frequently found in small entrepreneurial organisations. Within a power culture, there
are few rules and procedures and little bureaucracy. The centre exercises control
largely through the selection of key individuals. Organisations with this culture have the
ability to move quickly and react well to threat or danger. Any successful change initiative
in a power culture depends on the commitment of the central core and is likely to be
initiated through individuals rather than teams.

Handy points out that the role culture is often described as bureaucracy. The role-based
organisation rests its strength in its pillars or functions or what are often described as its
'silos'. The work of each department, and the interaction between the departments, is
controlled by procedures and rules, which are coordinated by a narrow band of senior
management. The logic being that if each of the separate pillars does their job, as laid
down by the rules and procedures, the ultimate result will be as planned. This culture is
most successful, according to Handy, in an environment, which is very stable, where the
market is stable or predictable and where product life cycles are long. Role cultures are
slow to perceive the need for change and slow to change even if the need is seen.

The task culture is job or project orientated. A matrix organisation structure is a classical
form and example of the task structure with much of the power and influence lying at the
interstices of the net. Influence, within a task culture is, according to Handy based more on expert power than on position or personal power. Influence is also more widely dispersed than in other cultures. The task culture is a team culture, where the outcome utilises the unifying power of the group to make improvements to the business. This culture is extremely flexible and adaptable. Groups, project teams, or task forces are formed for a specific purpose and can be reformed, abandoned or continued as and when the need arises. The task culture thrives where speed of reaction, integration, sensitivity and creativity are more important than depth of specialisation. It is the culture most in tune with ideologies of change and adaptation and appears to be the most effective culture to support a major change initiative.

The fourth culture identified by Handy is the person culture. In this culture the individual is the central point or focus and if there is an organisational structure then it exists only to serve and assist the individuals within it. Handy suggests that barristers' chambers, architects' partnerships, hippy communes, social groups, families, some small consultancy firms, are often oriented towards the person culture. Handy suggests that Individuals with this orientation are not easy to manage as there is little influence that can be brought to bear on them. Implementing and sustaining change within a person culture is difficult at an organisation wide level even though specific change initiatives at the individual level can be very successful.

Schein, (Senge, 1999) suggests that people who try to change organisations often run up against attitudes that seem unchangeable. 'We can't make any headway,' they decide, 'unless we can create a new culture around here.' Already, according to Schein, they have made an irreversible mistake.

You cannot create a new culture. You can immerse yourself in studying a culture (your own, or someone else's) until you understand it. Then you can propose new values, introduce new ways of doing things, and articulate new governing ideas. Over time, these actions will set the stage for new behaviour.
(Senge, 1999: 334-335)

If people who adopt that new behaviour feel that it helps them do better, they may try it again, and after many trials, which Schein suggests may take as long as five or ten
years, the organisational culture may embody a different set of assumptions, and a
different way of looking at things, than it did before. Even then, Schein suggests, the
culture has not been changed, the stage has been set for the culture to evolve.

It is interesting, at this point, to reflect on the two case studies undertaken at Tenneco,
SPC and Kaizen. The SPC case study resulted in a change in behaviour and attitude
during the 3 years that SPC was successfully run within the organisation. However, as
soon as a change in the SPC process occurred it died. There was little resistance from
the workforce to computerisation of SPC and this tends to indicate that any change in
the culture was at the superficial level only. It is likely that a deep seated culture change
would have initiated greater resistance from the people who would not have allowed SPC
to simply fade away and die. In comparison the Kaizen initiative is alive and well and is
now described as ‘part of the way we do business’. This has evolved over a ten-year
period and the culture change is more in line with Schein’s belief that deeper levels of
culture change are possible, but they are not simple or straightforward.

To change an organisation’s culture is to change the basic attitudes that members have
developed over the years of their career. That is why cultures resist change: Resistance
is a natural response to an aggressive attack against one’s values. To help evolve the
culture, Schein sets out a seven step process designed as a process of inquiry which he
believes will gain value with the insight, thoughtfulness and flexibility of the people
practicing them (Senge, 1999: 335-341).

So, what can be concluded from this short discussion on culture? Firstly, culture change
will occur naturally, but slowly, due to external pressures on the organisation and the
introduction of new people. Culture change can be managed but it is a long and difficult
process and needs to be carefully controlled. Schein suggested a series of seven steps
to facilitate the culture change process. Handy introduced four cultures that he defined
as; power, role, task and person. These four definitions are useful as they help to fill
some of the gaps between Burns and Stalkers two extremities; a mechanistic and an
organic structure.
Interestingly, it appears that an organic structure would be required to support a change or improvement process whereas a mechanistic approach would help to embed the change in the organisation. Thus, for ongoing continuous improvement it is likely that an organic or open culture is required together with a tightly controlled process that can integrate change into the organisational structure.

2.2.5 Processes and Pathways to Change

Section 2.2.2 introduced errors and assumptions that are made when attempting to implement and sustain organisational change. Section 2.2.4. discussed the importance of understanding the organisation's culture and the difficulties associated with culture change. This section discusses processes and pathways that can help organisations to overcome, or at least reduce, resistance to change and how to develop a change path that fits their needs. The different types of change that need to be considered and different ways in which organisations should respond to these different types of change will also be discussed.

All improvement involves change and the execution of change requires movement of the organisation from its current state to a desired future state. This transition requires careful management. The ability of management to manage this transition state and control change rather than be controlled by change is a characteristic of a successful organisation. Change can be external to an organisation typically, customers, technology, market structure, political and social environment, it can be internal, or it can be a combination of the two. The change process can be a long and painful one, as Clive Dolan, managing director of Siemens Plessey Electronic Systems suggests:

> It takes a long time to create change in an organisation. Change is really about producing consistency. Change becomes real when regularly, patiently, everyone in the organisation behaves in a way consistent with the new values.

(Taffinder, 1998:264)

Strebel (1994) describes two types of change, reactive and proactive and two forces for change, weak and strong that create pressure on an organisation to change. Reactive
change is a response to an external threat or opportunity. Proactive change is about developing and implementing change opportunities to improve the business, possibly when the business is doing very well. In situations that call for proactive change, people may agree intellectually that something more is needed to stay ahead, but when things are going well, Strebel suggests that it is not easy to get an emotional commitment to change.

The Ortho-Clinical diagnostics case study of the supermarket pull system, described in Chapter 5, is an example of the difficulties encountered when introducing a proactive change. The external forces for change were weak, and outside the Cardiff site there was very little support for the initiative.

Strebel (1994) introduces a change path diagnostic tool, Figure 11, that he believes can help to identify the most appropriate and viable change path for an organisation. The tool is designed to be applied before and during a change process in order to evaluate and monitor the company’s position and progress and change tactics if required.

![Figure 11: Change Path Diagnostic](Reproduced from Strebel 1994, Table 1:35)
When applying the change path diagnostic to a reactive change, the first question to be considered is whether the forces of change can be rolled back. If the change force can be rolled back, then Strebel proposes that the less radical change associated with renewal or resistance may be appropriate. If the change force is a business threat, then he suggests that the company is best off on a path of resistance using its resources and existing momentum to either avoid or roll back the change force. In contrast, Strebel explains that the company should try to adapt to a change force that represents a business opportunity.

Strebel suggests that a resistance path may be appropriate when strong resistance confronts a change force that is regarded as a threat but can be contained.

Table 8: Reactive Change Paths  (Strebel 1994:35)

<table>
<thead>
<tr>
<th>Interplay between forces of change and resistance</th>
<th>Change Path</th>
<th>Scope of Change</th>
<th>Pace of Change Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change force can be rolled back; represents a threat</td>
<td>Resistance</td>
<td>No internal change</td>
<td>Depends on ability to contain change force</td>
</tr>
<tr>
<td>Change force can be rolled back; but is an opportunity</td>
<td>Renewal</td>
<td>Change limited to parts of the organisation</td>
<td>Periodic stepwise change</td>
</tr>
<tr>
<td>Change force cannot be rolled back; time is available</td>
<td>Revitalisation</td>
<td>Ongoing change throughout the organisation</td>
<td>Slow continuous adaptation</td>
</tr>
<tr>
<td>Change force cannot be rolled back; very little time available</td>
<td>Restructuring</td>
<td>Intense change on a few dimensions</td>
<td>Sudden change jump</td>
</tr>
</tbody>
</table>

Strebel suggests that a renewal path is appropriate when the change force represents an opportunity that can be exploited with stepwise change. If the change forces cannot be rolled back, only the more radical change associated with restructuring and revitalisation will be able to adapt the company to the change force. A revitalisation path is appropriate when resistance based on culture must be overcome and the organisation must adapt to a strong and growing change force. A restructuring path is, according to Strebel, appropriate when a strong and growing change force confronts strong
resistance that is closed to change. On this path the organisation is given a sharp shock to try and adapt it to the environment.

Strebel points out that one of the major benefits of using the change path diagnostic is that a radical change campaign may require a number of different moves or approaches and ongoing application of the diagnostic can help to identify these. An example of the use of the model is provided through a case study of the revival of Harley Davison (Strebel 1994: 41 - 42). The change process for the Harley Davidson case study is summarised by Strebel (1994:42) as:

- Path 1: Resistance path to stay in the game by shielding operations from the most urgent change forces with financial restructuring and W Davison's designs.
- Path 2: Revitalising to catch up with the Japanese by changing the culture and moving production toward continuous improvement
- Path 3: Renewal to outperform the Japanese by incremental addition of value through marketing (Super Ride and HOG programmes)

The change points described above are based on reactive change. Reactive change, although difficult in itself to pursue and accomplish is often the easiest form of business improvement as management are often confronted with a scenario that they have to deal with and ultimately a decision to be made. The second type of change is proactive change. Proactive change is about developing change opportunities in order to improve the business, often when the business is doing very well.

When using the change path diagnostic to select a proactive change path the first question to be considered is whether the forces of change can be easily identified. When the change forces are easy to identify, action is required in order to exploit the new opportunity as soon as possible and hopefully before the competition. In contrast, when the environmental change forces are more difficult to identify, an exploratory
response may be needed to enable the organisation to discover the direction of the change forces.

Strebel suggests that the most effective way of creating action and change for emerging change forces, that can be identified, is to try and create tension between where the organisation is and where it should be. Fritz (1999) develops this idea of tension further and suggests that in order to create an organisation, which will be receptive to change, then it is necessary to create a path of least resistance, which supports the change and ensures that the actions 'automatically' follow the required change path.

The next question posed is whether the organisation is open or closed to change. If the organisation is closed to change, then Strebel suggests that it might need to be jolted into recognising the forces of change: for example, by initiating a breakpoint in the form of an organisational realignment.

Table 9: Creating Proactive Change  (Strebel 1994:45)

<table>
<thead>
<tr>
<th>Forces of change and resistance</th>
<th>Change Path</th>
<th>Nature of Path</th>
<th>Motivation to change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change force easy to identify; organisation closed to change</td>
<td>Corporate Realignment</td>
<td>Organisational contrast with another approach</td>
<td>Challenge to resolve organisational tension</td>
</tr>
<tr>
<td>Change force easy to identify; organisation open to change</td>
<td>Cascading Implementation</td>
<td>Progressive adaptation to change forces</td>
<td>Participative commitment</td>
</tr>
<tr>
<td>Change force difficult to identify; organisation closed to change</td>
<td>Focused Re-engineering</td>
<td>Benchmarking, Explicit focused comparisons</td>
<td>Threat implicit in performance of benchmark</td>
</tr>
<tr>
<td>Change force difficult to identify; organisation open to change</td>
<td>Bottom-up Experimenting</td>
<td>Learning by example from successful internal change</td>
<td>Competition to match example</td>
</tr>
</tbody>
</table>

If the organisation is open to change, then Strebel suggests that identified managers can be encouraged to become change agents to exploit the change force in their respective business areas or units.
Even when the benefits of a change initiative are understood, resistance to change still occurs. Isaac Newton (1642-1727) stated in his third law of motion that 'to every action there is an equal and opposite reaction'. Could this be the same with change? Is it a natural law that cannot be altered?

Goodstein and Burke (Mabey and Mayon-White, 1993) suggest that organisations tend to be homeostatic, or continuously working to maintain a steady state. According to them, this helps to clarify why these organisations require external impetus to initiate change and why that change will be resisted even when it is necessary. Similarly, Lewin (1951) suggested that the first step to achieving lasting organisational change is to deal with resistance to change by unblocking the present system.

Ansoff (1988) discusses change, resistance to change and change in a discontinuity and in his opinion:

Resistance to change is proportional to the degree of discontinuity in the culture and or the power structure introduced by the change.

(Ansoff 1988:238)

Ansoff suggests that individuals and groups will resist change in proportion to the degree of threat and discomfort caused by the current increment of change only. In other words he explains, in resisting change, the affected individuals typically take the short-term view of its consequences, and seldom concern themselves with the cumulative impact of all of the future increments.

Ansoff discusses a number of different methods of introducing change, one such example being referred to as a coercive change process, which uses power to overcome resistance to change. In his opinion the coercive approach must be used when urgency is high and rapid response is essential.

Ansoff's ideas are specifically related to the introduction of strategic change. However, one essential point emphasised is the need for ongoing monitoring of the change process and continual review in order to ensure the sustainability of the change.
The second process identified by Ansoff is very similar to continuous improvement or kaizen. Ansoff uses the term *adaptive change process*, which he describes as a step-by-step accumulation of incremental changes, which, over a long period of time, add up to transformation of culture, power structure, and competence. Because the change is spread over a long period of time, then at any given time Ansoff suggests that the resistance will be low, but not absent. Adaptive change is slow, but has the virtue of minimising the level of resistance at any given time. Conflicts are resolved through compromises and bargains.

A third approach suggested by Ansoff is an approach half-way between the two extremes, which he calls *the managed-resistance or accordion*, method. Parallel planning and implementation are key elements of this approach and Ansoff suggests that resistance is minimised at the outset and controlled throughout the duration of the change.

The advantage of the managed resistance method, according to Ansoff, is that it tailors the firm's response to the external pressures, and to the internal realities. The disadvantage is that it is more complex than either of the two extreme approaches. The obvious main advantage of the accordion method is that it attempts to strike the best possible tradeoff between reducing resistance and use of power, within the limits of the available time.

Sustaining change requires an understanding of the forces and challenges that impede progress and a means of developing workable strategies for dealing with these challenges. Fritz (1999) suggests organisations can be compared with energy in that they move along a path of least resistance. He discusses changes that in themselves may be excellent but if they are imposed on an organisation against the path of least resistance then he believes that they will inevitably fail. This is because the ‘path of least resistance’ or the natural way for the organisation to react, in this example, is to resist the change. In order to prepare an organisation to be receptive to change, then Fritz believes that it is necessary to create a path of least resistance, which supports the
implementation of the change. Thus, the natural way for the organisation to react would be to support the change and this makes it much more likely that the change effort will succeed. Fritz introduces three insights that are the basis of the path of least resistance.

Organisations move naturally along the path of least resistance and any changes that do not take this path into account, and inadvertently violate the path of least resistance, will either not work or require extensive and committed effort to try to make it work. Fritz suggests that structure determines the path of least resistance, and organisations are subject to inescapable structural laws that govern their behaviour. Fritz explains that a change of structure leads to a change in the path of least resistance and that the underlying structures of organisations can be changed and thus it is possible to change the flow of work. Thus, according to Fritz, structure determines the path of least resistance. Therefore, in order to change the path or to pursue a different path then structure has to be analysed and, if possible, changed.

So what is structure? Pugh (1973) introduced six primary variables to measure and analyse organisational structure, specialisation, standardisation, standardisation of employment practices, formalisation, centralisation and configuration or shape of the organisation. His research was based around whether there were general principles of structure to which all organisations should adhere or whether the context of the organisation, that is size, ownership, geographical location, technology of manufacture determined the appropriate structure. Pugh concluded that context is a determining factor that will shape and modify the structure of an organisation but just as important an influencing factor (possibly as high as 50%) on an organisation are the policies and attitudes of management.

Burns (1963) suggests a mechanistic form is appropriate to stable conditions and an organismic one is more suitable for change situations so why don't organisations just adapt to change requirements by altering their structure from mechanistic to organismic? One problem, he suggests is that individuals are not only committed to the organisation as a whole but that they are
Deeply concerned with the position they occupy, relative to others, and their future betterment are matters of deep concern
(Burns, 1963:20)

Even though it may be difficult to change structure because of resistance, nevertheless, Burns and Stalker (1994) explain that both types of organisation structure, mechanistic and organic, may be explicitly and deliberately created and maintained to manage the human resources of an organisation in the most efficient manner. They also point out that there are intermediate stages between the extremities. They suggest that the relation of one form to the other is elastic, so that an organisation oscillating between relative stability and relative change may also oscillate between the two forms. An organisation often operates with a management system that includes both types.

The literature (Burns & Stalker, 1994), (Fritz, 1999) suggests that it is possible for organisations to be re-designed so that the path of least resistance begins to flow in the required direction, usually in a manufacturing organisation from supplier to end user or customer. However, it takes work to learn how to do this and the changing of an organisation's structure is easier to talk about than to implement. Redesigning the organisation, according to Fritz, is at least a two-step process: understanding first, application second.

This section has investigated and discussed processes and pathways to change and how structure can influence the success and sustainability of change. Proactive and reactive changes were introduced and the various pathways to change were considered using the change path diagnostic. Depending on the strength of the forces for change and the internal resistance, different actions were suggested. When the change forces are strong, the main issue is whether and when resistance will be overcome. When the change forces are weak, the question to be asked for initiating proactive change is whether the forces can be readily identified.

Ansoff (1988) suggested the coercive approach to overcome resistance to change, a short sharp hit, the managed resistance or accordion method, which relates the
organisational response to external demands and internal realities, and the adaptive method which is a slower paced, low urgency approach.

Fritz (1999) suggested developing a path of least resistance which is supportive of the change. That is, the natural or easiest way for the organisation to move is in the direction of change. To develop a path of least resistance requires changing the underlying structure of the organisation.

Encouragingly, Burns and Stalker (1994) propose that structure can be managed and changed. However, they also indicate that this is not straightforward due to the natural resistance of employees. Pugh (1973) suggested there are six primary variables that constituted structure, however, he also emphasised that the policies and attitude of management was a major influencing factor in the management and changing of structure.

The main learning points from this section are that structure has a major influence on change, however, structure can be adapted, by management, and a path of least resistance created to support change and lower resistance to change. Also, there is no simple, one off approach to change that suits every organisation. The approach to change has to be developed and managed and a number of factors have to be considered. There is no generic right or wrong way. Management needs to look for, and develop the pathway or process to change that fits the organisation.

To sustain an improvement programme the need for monitoring and adjusting the tactics accordingly is paramount. The next section looks at some of the performance measures and performance measurement systems that can support this objective.
2.2.6 Performance Measurement

In the last decade there has been growing criticism of management control as being too narrowly focused on financial measures. Conditions today are different from those when traditional management control emerged. Historically, traditional (accounting) performance measures have been focused on the standings of the asset. They originated through the need to report the performance of the directors to the shareholders. This type of accounting developed with the first joint stock companies of the eighteenth century and in particular with the canal companies. Thus, the internal monitoring and reporting processes have evolved towards this end. Even the development of management accounting, in the late 19th and 20th centuries, with its emphasis on budgeting and cost control did not change this perception. It is only quite recently, possibly due to supply outstripping demand, that the balance has begun to tilt towards the customer, and that the wisdom of some historical measures has been called into question.

For example, stock has traditionally been regarded as an asset and shown as such on the balance sheet, but the concept of JIT regards stock as a liability in terms of the manufacturing system. Stock is an asset when it is eventually sold but this is increasingly difficult to be sure about and so the rationale behind stock being regarded as an asset is becoming increasingly difficult to justify. Performance measurement systems need to become much broader and focus on a range of measures both financial and non-financial, they should be the principal means of aligning the expectations, behaviour and decisions of the organisation to its strategic direction (Kaplan, 1984). They should balance short and long term goals and focus attention on improvement activities that contribute to the achievement of the strategic objectives (Kaplan, 1989). The measures will then indicate the effectiveness of the improvement activity in the short term and whether the organisation is progressing towards its longer-term strategic objectives.

Maskell (1989) points out that the performance measures chosen must measure directly the success or failure of the manufacturing strategy. The organisation needs to know
whether it is improving or getting worse and people concentrate on the things that are being measured. Maskell (1992:19) lists seven characteristics that link performance measures in world-class manufacturing companies. They should:

* relate directly to the manufacturing strategy.
* be non-financial.
* vary between locations.
* change over time - continuous improvement.
* be simple and easy to use.
* provide fast feedback and assist the resolution of problems.
* teach rather than just monitor.

Ralston (1992) suggests five areas where measures should be undertaken; quality; lead time; flexibility; cost; customer service and a measure related to the introduction of products and processes - innovation. Hronec (1993) stresses that the best performance measures give balance to the company's operations and are deployed throughout the organisation in a way that links strategy to processes and processes to one another. He suggests using two types of performance measures, process and output (Figure 12).

**PROCESS MEASURES**

* Report the activities of a process
* Motivate the people and control the process

![Diagram of process measures]

**OUTPUT MEASURES**

* Report the results of a process
* Control resources and monitor results

*Figure 12: Process and Output Performance Measures.*

(Source: Hronec 1993, Figure 1.2, p 17)
Process performance measures monitor the activities of a process and help to control the process by allowing people to anticipate and prevent problems. Output performance measures report the results of a process and are used to control resources. The right balance of output and process measures - output to keep score and process measures to drive improvement - are required for a company to achieve its strategic objectives. An output measure for one area can be an input measure for the next downstream unit resulting in, 'performance measures that link the mission, strategy, goals and processes of the organisation.' (Hronec, 1993:16)

Zairi (1994) discusses the importance of performance measurement fitting the culture of the organisation. He suggests that measures have to reflect many of the criteria which make an organisation unique. These include the processes, the structure in place, the management style, the knowledge and skill base, the market, and even the customer base.

Kaplan and Norton (1992) suggest an approach that uses a set of measures that provide top managers with a fast but comprehensive view of the business. This process based around a family of key measures that are linked and aligned to the strategy was developed by Kaplan and Norton (1992) and became known as the balanced scorecard. The scorecard is based on the premise that managers require a balanced presentation of both financial and operational measures. One of the keys to the success of the balanced scorecard is that according to Kaplan and Norton (1992:73), 'the balanced scorecard forces managers to focus on the handful of measures that they identify as being most critical.' To implement the balanced scorecard they suggest that companies need to articulate goals for time, quality, performance and service and then translate these goals into specific measures.

The secret is to link internal measures with the actions taken by individuals that affect overall corporate or business objectives. This congruence throughout the system, from strategy to operational control and activity helps to ensure that employees at all levels are contributing to the company's strategy, all singing off the same hymn sheet. The
scorecard is designed to be deployed through the organisation and the measures should not only give results and keep score of where the company is, but also provide a spur for action and direction based on the old premise of what gets measured, gets done.

This section has discussed the need for both financial and non-financial performance measures to monitor the progress of a business towards its strategic objectives.

2.2.7 Summary of points

The need or drive behind a change initiative or requirement is generally a response to some significant threat or opportunity arising from outside the organisation. For organisations to survive and grow they must constantly scan what is happening and develop an awareness of what actually needs changing, within the organisation, in order to move in an appropriate direction.

Strebel (1994) discusses a number of factors that need to be considered when developing a change programme. He introduces a change model based on the source of the change (reactive vs. proactive), the strength of the change forces and the organisations likely reaction to the change. This results in a preferred model for change at that particular point in time. Strebel, suggests that the model should be re-applied as the change initiative takes root in the organisation, or as it fails to take root. This encourages different approaches as the organisation responds to the forces for change.

There are a number of conditions, which are likely to support the pursuit of successful change. Kotter suggests an eight step practical model for change, which assumes that the organisation has recognised the need for change and understood the best process or initiative that can facilitate the change. The right conditions for change need to be identified and the most appropriate course of action needs to be evaluated and utilised, initially by the management team.

The barriers to successful change need to be identified and if possible the root cause of the resistance should be identified and eliminated at an early stage. The need to
consider the organisation's culture was discussed. Culture is starting to be acknowledged as a central factor in successfully implementing and sustaining organisational change. The difficulty of precisely defining the culture of an organisation was recognised, nevertheless, it is important that the culture of each individual organisation is examined and understood and, if necessary, evolved to match and support the change process being considered.

The path of least resistance is a powerful way of supporting a change programme. However, in order to identify and create a path of least resistance that supports rather than resists change it is necessary to alter the underlying structure. Fortunately, it is generally believed that structure can be altered, although this is not a straightforward task and it requires full commitment from the management team.

2.2.8 Comments

The literature review identifies a number of common, essential factors that enhance the potential for success when introducing a new improvement initiative or business transformation. What has also been concluded is that although there are common, generic factors these factors and the most appropriate pathway to change varies from organisation to organisation. Specific factors need to be selected and specified depending on certain fundamental characteristics of each individual organisation such as culture, management style and strategy, typically the three levels illustrated in Figure 1.

In Chapter 6 a model with a number of common generic factors that can be appropriately assigned to each individual organisation has been developed and tested. The model includes techniques and tools that facilitate the implementation of improvement processes and help to develop a unique 'strategy for change' for each business. This strategy for change is aligned with the organisational culture as described earlier.

Programmes for continuous improvement and change often neither improve nor change a company. All too often, improvement is viewed as a one-off effort, and change is regarded as a one-time move to a new, higher state. To organise and prepare for
Continuous, never ending improvement and continuous, unpredictable change requires that the structure of the organisation and the people in the organisation are capable of constant re-alignment. Improving the ability to deal with change is accomplished if everyone in the organisation feels that doing so is his or her personal responsibility. The challenge is to generate a constantly adapting structure and to have all employees perceive that constantly dealing with continuous improvement and change is their personal responsibility.

There is no magic formula for sustainable performance improvement within an organisation. However, the information gathered through the secondary research and the primary, case study research has enabled a process model to be developed. This model will help to provide a structured approach to sustainable performance improvement within an organisation. Chapter 6 provides more detail regarding the development and testing of the model.
Chapter 3
CHAPTER 3: METHODOLOGY

3.1 Introduction and General Approach

This chapter describes research strategy and tactics and how the most appropriate methodology was selected, developed and used to rigorously test each of the research questions defined as an outcome of the secondary research reported in Chapter 2. This chapter considers a number of options for executing the necessary primary research and justifies that the methodology selected for each of the research questions is appropriate, relevant and effective. The true test, of course, will come later when the results and conclusions are formulated at the end of the research process.

Figure 13 illustrates the approach used to investigate the research questions and research aim. The research was divided into three phases which provided a logical structure to the investigation. Phase 1 was concerned with investigating Research Question 1 and was based on a survey. This was followed by Phase 2, the detailed investigation of the case studies which addressed Research Questions 2 and 3. Finally, in Phase 3 the model that had been developed was tested for functionality through a pilot test, and for practicality and usefulness through three experiments in three separate organisations.

Before undertaking the primary research key decisions have to be made regarding the strategy and methods (or tactics) that will be used. Research strategy is concerned with determining the relevant approach to use, for example, whether to use a survey or to carry out an experiment or to undertake action research or another appropriate, identified process. The research strategy aims to answer the question 'what type of research is appropriate?' Research tactics are the more detailed decisions related to questionnaire design and structured interview design including the types and quantity of questions used. It is important that there is congruence between research questions and the methods that are chosen to explore them. Marshall & Rossman (1995:40) suggest that the '(research) strategy is a roadmap, an overall plan for undertaking a systematic exploration of the phenomenon of interest; the methods are the specific tools for conducting that exploration'.
Research Aim and Questions Developed

Phase 1: Investigate RQ 1
- Prediction?
- Survey
- Problem Confirmed?
  - NO
  - YES

Phase 2: Investigate RQ 2 & 3 and gather data for the Model
- Explanatory
- Case Studies
- Development of factors, problems and reasons.
- Possible further literature search
- Sufficient Information?
  - NO
  - YES

Phase 3: Develop Model
- Pilot test model, thought exp.
- Does the model work?
  - YES
  - Validate model, 3 experiments
  - Research Aim achieved
  - NO

Figure 13: Approach used to investigate Research Questions and Aim
Thus, it is necessary to determine the research strategy before developing the detailed research methods or tactics. The strategy or road map needs to be in place before the road signs or tools and techniques can be selected. The research tactics can then be developed and are concerned with how the strategy will be carried out (Figure 14).

![Diagram: Relationship between Strategy and Tactics]

**Research Strategy**

'What type of Research is appropriate?'

**Level 1**

**Research Tactics**

'How will the strategy be carried out?'

**Level 2**

**Figure 14: Relationship between Strategy and tactics**

In order to determine the most appropriate strategy to investigate each of the phases it was necessary to carry out secondary research into the strategies available and their applications. Marshall & Rossman (1995) identify five distinct strategies: experiments, surveys, archival analysis, histories and case studies and what they describe as more explicitly qualitative strategies such as field studies, ethnography (a special case of field studies) and in depth interview studies. Action research, as defined by McNiff (1988) was a further strategy that was considered.

It is also important to consider the ethical requirements when undergoing research and fundamentally these requirements can be linked to the following questions outlined by Kervin (1992:38)

1. Will the research process harm participants or those about whom information is gathered (indirect participants)?
2. Are the findings of this research likely to cause harm to others not involved in the research?
3. Are you violating accepted research practice in conducting the research and data analysis and drawing conclusions?
4. Are you violating community standards of conduct?

These questions were considered throughout the primary research element of this research. No negative answers to any of the above questions emerged and there was no need to re-design any of the research to overcome them. All potential respondents to the survey questionnaire were provided with a covering letter, which details the work being undertaken (Appendix 1), complete confidentiality and the opportunity to see the survey results. The participants in the case studies were given a draft copy of the report and an opportunity to correct and amend any information before it was published within the research.

Thus, the first task is to determine the research strategy that will most effectively investigate the research questions developed in Chapter 2. Table 10 was used to assist with the selection of an appropriate research strategy to test each of the research questions. The process used was to match each research question with the relevant study purpose and then work horizontally to identify the recommended and the most appropriate strategy. Sections 3.2 and 3.3 describe in more detail the development of the specific approaches used to fully investigate the research questions.
Table 10: Matching Research Questions with Strategy.
(Reproduced from Marshall & Rossman 1995, Table 3.1, p. 41)

<table>
<thead>
<tr>
<th>Purpose of the Study</th>
<th>Research Question</th>
<th>Research Strategy</th>
<th>Examples of Data Collection Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPLORATORY</td>
<td>What is happening in this social programme? What are the salient themes, patterns, categories in participant's meaning structures? How are these patterns linked with one another?</td>
<td>Case study field study</td>
<td>participant observation in-depth interviewing elite interviewing</td>
</tr>
<tr>
<td>EXPLANATORY</td>
<td>What events, beliefs, attitudes, policies are shaping this phenomenon? How do these forces interact to result in the phenomenon?</td>
<td>Multisite case study history field study ethnography</td>
<td>participant observation in-depth interviewing survey questionnaire</td>
</tr>
<tr>
<td>DESCRIPTIVE</td>
<td>What are the salient behaviours, events, beliefs, attitudes, structures, processes occurring in this phenomenon?</td>
<td>Field study case study ethnography</td>
<td>participant observation in-depth interviewing document analysis unobtrusive measures survey questionnaire</td>
</tr>
<tr>
<td>PREDICTIVE</td>
<td>What will occur as a result of this phenomenon? Who will be affected? In what ways?</td>
<td>Experiment quasi-experiment</td>
<td>survey questionnaire (large sample) kinesics/proxemics content analysis</td>
</tr>
</tbody>
</table>
3.2 Development of Phase 1: Research Question 1

This section describes Phase 1 and the development of the approach used to investigate Research Question 1. The initial exercise was to identify the most appropriate means of investigating Research Question 1 using Table 10 as a guide. Research Question 1 asks whether it is true that something is occurring (too many initiatives attempted) and whether the effects of this occurrence are evident in failure. The question is written as a test of an assumed truth or possibly a prediction. Does 'x' occur in practice? It was determined that Research Question 1 best matched the predictive area of Table 10. This suggested that an experiment, in the form of a survey questionnaire would be an appropriate means for investigating this research question.

A survey is used to gather data and obtain information that can be analysed and compared. Denscombe (1998) asserts that a survey is a research strategy not a tactic as there are many methods that can be incorporated into the collection of the data. He suggests that a survey pertains to a given point in time and should incorporate as wide and as inclusive data as possible. Typical types of survey are postal questionnaires, face to face interviews, telephone interviews, documents and observations. Surveys are useful to provide a snapshot of how things are at the specific time at which the data are collected. The advantage of a survey is that data can be collected and the search is purposeful and structured. Surveys can also provide a span of vision that is wide and inclusive and, provided this breadth of cover is sufficiently wide and inclusive it can give credibility to generalised statements made on the basis of the research.

Table 11 suggests that there are a significant number of strengths, which are covered by the use of a survey. By reviewing Table 11 the strengths of the survey/questionnaire approach were identified as:

- Data easy to manipulate
- Easy and efficient to administer and change
- Easily quantifiable
- Facilitates analysis and validity checks
Table 11: Strengths of Data Collection Methods
(adapted from Marshall & Rossman 1995, Table 4.1 p.100)

<table>
<thead>
<tr>
<th>Strengths</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data easy to manipulate and categorise for data analysis.</td>
<td></td>
<td></td>
<td>x</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td></td>
<td></td>
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<tr>
<td>Face-to-face encounter with informants.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>.</td>
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<tr>
<td>Obtains large amounts of expansive and contextual data quickly</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>x</td>
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<tr>
<td>Facilitates co-operation from research subject.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Facilitates access for immediate follow-up data collection for clarification and omissions.</td>
<td>x</td>
<td>x</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td>D</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allows wide range of types of data and informants, thus avoiding sampling of 'pocket of the universe'.</td>
<td>x</td>
<td>.</td>
<td>.</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D</td>
<td>D</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy and efficient to administer and manage.</td>
<td></td>
<td></td>
<td>.</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<tr>
<td>Easily quantifiable and amenable to statistical analysis.</td>
<td></td>
<td></td>
<td>.</td>
<td>.</td>
<td>x</td>
<td>.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<tr>
<td>Useful for discovering complex interconnections in social relationships.</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>Easy to establish generalisability.</td>
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<tr>
<td>Data are collected in natural setting.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td>x</td>
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<td>x</td>
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<tr>
<td>Good for documenting major events, crises, social conflicts.</td>
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<tr>
<td>Good for obtaining data on non-verbal behaviour and communication.</td>
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<td>Collects data on unconscious thoughts and behaviour.</td>
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<td>Previous researchers have developed usable measuring devices.</td>
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<tr>
<td>Facilitates analysis, validity checks and triangulation.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
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<tr>
<td>Facilitates discovery of nuances in culture.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
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<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Provides for flexibility in the formulation of hypotheses.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
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<tr>
<td>Provides background context for more focus on activities, behaviours and events.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
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<tr>
<td>Great utility for uncovering the subjective side, the 'natives perspective' of organisational processes.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>D</td>
<td>x</td>
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<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
</tr>
</tbody>
</table>

Note: x=strength exists; D=depends on use. 1=Participation Observation, 2=Interview, 3=Ethnographic Interviewing, 4=Elite Interviewing, 5=Focus Group Interviewing, 6=Document Review, 7=Narratives, 8=Life History, 9=Historical Analysis, A=Film, B=Questionnaire, C=Proxemics, D=Kinesics, E=Psychological Techniques, F=Unobtrusive Measures.
It is also wise to be aware of the weaknesses of data collection methods and Table 12, relates identified weaknesses to specific data collection methods. The potential weaknesses identified from Table 12 for a survey/questionnaire approach include:

- Can lead the researcher to miss the forest whilst observing the trees, fail to see the big picture
- Can require expensive materials
- Highly dependent on the ‘goodness’ of the original research question/s

The aim of a survey, according to Bell (1999) is to obtain information, which can be analysed and patterns extracted and comparisons made. It was decided to use a one-page survey, consisting of short questions that could be completed by the respondent, without assistance, in fifteen to twenty minutes. One of the reasons for the brevity of the survey was to encourage a high number of responses as it is generally accepted that responses to surveys are quite low. Denscombe (1998) suggests that a researcher can regard themselves as lucky if they achieve a return of 20%.

The strategy and research tactics have been discussed and selected and it was decided that a survey in the form of a questionnaire should be used to investigate Research Question 1. Chapter 4 provides further detailed information of the design of the survey and the results of the investigation undertaken.

### 3.3 Development of Phase 2: Case Study Research

This section describes the logic behind the selection of Case Study research to investigate Research Questions 2 & 3. Research Question 2 is split into four sub questions and Table 10 was used to determine the most appropriate research strategy to fully investigate each sub question. It was decided that Research Questions 2a and 2b ‘What are the reasons for the success and failure of improvement initiatives?’ and ‘What are the reasons for failure of improvement initiatives?’ fit best within the explanatory area of Table 10 as a key research question that could be applied is ‘what events, beliefs, attitudes, policies are shaping this phenomenon?’ This indicates that a multi-site case
study using in-depth and/or elite interviewing could provide information that would fully investigate questions 2a and 2b of Research Question 2.

Questions 2c and 2d of Research Question 2, are investigating the factors that need to be in place to support the success and sustainability of an improvement programme. These questions again fit well with the explanatory area of Table 10 as they are attempting to identify plausible causes or event that will help to shape the success of the programme.

Research Question 3 questions whether management are failing to take a strategic and planned approach to the introduction and sustainability of improvement initiatives? After evaluating Research Question 3 it was again decided that this question tended to fit the explanatory area of Table 10. After careful consideration of the strategies available it was decided to use a case study approach, using elite interviews to investigate Research Questions 2 and 3.

The decision on whether to use a case study is a strategic one relating to the scale and scope of the investigation. A case study is defined by Kervin (1992:724) as:

an intensive examination of a single instance of a phenomenon of interest, such as a factory or a leveraged buyout. Often used in exploratory stages of research.

Yin (1994) explains that even though the case study is a distinctive form of empirical enquiry, it is, like other research strategies a way of investigating an empirical topic by following a set of pre-specified procedures. Typically, a case study can be developed through interviewing, direct observation, or even Action Research. Denscombe (1998) suggests that the main benefit of using a case study approach is that it allows the researcher to deal with the subtleties and intricacies of complex social situations. The analysis is holistic rather than based on isolated factors. Also, Denscombe suggests that the case study approach can be effective by allowing the researcher to concentrate effort on one research site or just a few sites. One of the difficulties of case study work
Table 12: Weaknesses of Data Collection Methods
(adapted from Marshall & Rossman 1995, Table 4.2 p.101)

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>A</th>
<th>B</th>
<th>C</th>
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<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can lead the researcher to miss the forest while observing the trees</td>
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<td></td>
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<td>x</td>
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<tr>
<td>Data are open to misinterpretation due to cultural differences</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>Requires specialised technical training for data collection</td>
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<td>Dependent upon the co-operation of a small group of key informants</td>
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<td>Fraught with ethical dilemmas</td>
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<td>Difficult to replicate; procedures are not always explicit or are dependent upon researcher's</td>
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<td>opportunity or characteristics</td>
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<td>Data often subject to observer effects; obtrusive and reactive</td>
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<td>x</td>
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<td>Expensive materials and equipment</td>
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<td>Can cause danger or discomfort for researcher</td>
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<td>Especially dependent on the honesty of those providing the data</td>
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<td>An overly artistic or literary style of presentation can obscure the research</td>
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<td>Highly dependent on the ‘goodness’ of the original research question</td>
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<td>x</td>
</tr>
<tr>
<td>Highly dependent upon the ability of the researchers to be resourceful, systematic and honest</td>
<td>x</td>
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</tbody>
</table>

Note: x=weakness exists; D=depends on use. 1=Participation Observation, 2=Interview, 3=Ethnographic Interviewing, 4=Elite Interviewing, 5=Focus Group Interviewing, 6=Document Review, 7=Narratives, 8=Life History, 9=Historical Analysis, A=Film, B=Questionnaire, C=Proxemics, D=Kinesics, E=Psychological Techniques, F=Unobtrusive Measures.

can be gaining access to appropriate sites or ‘cases’ and also obtaining information, some of which may be perceived as being confidential. Denscombe (1998:32) suggests that the strength of case studies is that they:

focus on one instance (or a few instances) of a particular phenomenon
with a view to providing an in-depth account of events, relationships, experiences or processes occurring in that particular instance.
The most relevant strengths of a case study approach were identified from Table 11 as:

- Obtain large amounts of data quickly
- Facilitates co-operation from research subject
- Data collected in a natural setting
- Facilitates analysis and validity checks
- Great for uncovering the subjective side of organisational processes

Whilst the weaknesses for a case study were identified from Table 12 as:

- Data open to misinterpretation due to cultural differences
- Highly dependent on the co-operation of the interviewee/s
- Difficult to replicate
- Data often subject to observer effects, obtrusive and reactive
- Highly dependent on the honesty of the interviewee/s
- Highly dependent on the ability of the researcher to be resourceful, systematic and honest to control bias

Multiple case studies need to follow replication logic and to ensure reliability of the outcomes of the case studies a framework (Figure 15) was developed and used. The objective was to develop information that would fully investigate Research Questions 2 and 3 and provide information that would support the design of a generic model for sustainable improvement.

It was decided that in-depth and elite interviewing, using a semi-structured questionnaire would be used to carry out the case study work. Denscombe suggests that one of the strengths of a case study is to provide the opportunity to delve into things in more detail and discover things that might not have become apparent through more superficial research. Taking this into account then the use of elite and in-depth interviewing is fully justified in respect of its potential ability to generate a range of information in line with the needs of the research.
The quality of a research design is important and Yin (1994:33), when discussing case study research, suggests that this can be judged using four tests.

- **Construct validity:** establishing correct operational measures for the concepts being studied.
- **Internal validity:** establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships.
- **External validity:** establishing the domain to which a study's findings can be generalised.
- **Reliability:** demonstrating that the operations of a study – such as the data collection procedures can be repeated, with the same results

Construct validity is related to the development of a sufficiently operational set of measures. Yin suggests that the investigator must cover two steps.

- Select the specific types of changes that are to be studied
- Demonstrate that the selected measures of these changes do indeed reflect the specific types of change that have been selected
In respect of the first step the case studies were designed with specific objectives of identifying information that could be used to assist with the development of a sustainable improvement model. The types of changes to be studied were specifically related to this objective as they were examples of two improvement initiatives at three different organisations. To satisfy the second step, suggested by Yin, the strategy was to use appropriate individuals (Senior Project Manager for the initiative) to work through a structured interview using a pre-designed questionnaire and to give them the opportunity to reflect on and discuss the outcomes.

The efficiency of the case study approach developed was difficult to quantify but the plan was to use a structured approach with a series of closed (for comparison) and open (for information gathering) questions. The concern over internal validity for case study research may be extended to the broader problem of making inferences. An investigator will 'infer' that a particular event resulted from some earlier occurrence, based on interview and documentary evidence. Is the inference correct? The structured questionnaire was designed and used to hold the questionnaire in a framework that could be repeated for each of the case studies and provide confidence that the inferences from each case study could be compared and used to develop 'generic' explanations for the causes that were identified.

External validity was achieved through careful selection of the case companies and the initiatives being studied within each organisation. There was a degree of confidence that the outcomes of the case studies would provide relevant information for the development of the model and fully investigate the appropriate research questions. The outcomes from the case studies were supplemented with information from secondary research to help develop the sustainable improvement model.

The design of the case study followed an embedded design using a structured questionnaire but also included the opportunity for broader information through the interviewing process used. The outcomes of the case-study research are described in
Chapter 5. In conclusion a well designed case study will yield lots of information and data if developed properly but may be suspect in terms of efficiency.

3.4: Testing the Model: Phase 3
The overall aim of the research was to develop a model which will provide a guide to the main factors and issues that need to be addressed when introducing and attempting to sustain performance improvement. To fulfill this aim it was necessary not only to develop the model but ensure that it was tested thoroughly. This section describes the approach used to test the model. The testing of the model, through its application, is described in detail in Chapter 6.

The research strategy engaged used field experiments to test the model in a practical working situation. The tactics adopted were to work through the model with a group of appropriate employees from the participating organisations. The model was applied to a real performance improvement opportunity using the researcher to facilitate the process.

Prior to the field experiments being carried out it was decided to test the model through the use of a pilot experiment. The objective of the pilot experiment was to ensure that the model flowed in a logical way and produced a practical, working output. The use of a pilot experiment would enable minor adjustments to be made, if required, prior to the full application of the model. It also gave the researcher the opportunity to ‘test run’ the model in a more relaxed, albeit real, situation.

The objective of the experiments was to test the sustainable improvement model by gathering information and obtaining feedback regarding its workability, logic and usefulness from a practical perspective and identifying opportunities to improve it. The advantage of an experimental approach is that the conditions can, to a certain degree, be controlled and manipulated to suit the requirements of the researcher.
In order to ensure that the field experiments would fully satisfy the objectives described, Tables 11 and 12 were used to highlight the relevant strengths and weaknesses of a field study approach. These were as follows:

**Strengths**

- Obtains large amounts of expansive and contextual data quickly
- Face to face encounter with informants
- Facilitates co-operation from research subject
- Great utility for uncovering the subjective side, the ‘natives perspective’ of organisational processes
- Data are collected in natural setting
- Good for obtaining data on non-verbal behaviour and communication.

**Weaknesses**

- Difficult to replicate; procedures are not always explicit or are dependent upon researcher's opportunity or characteristics
- Data often subject to observer effects; obtrusive and reactive
- Highly dependent upon the ability of the researchers to be resourceful, systematic and honest to control bias

To preserve internal validity and improve replication it was decided to use the same version of the model for each experiment. Each application of the model was carefully explained and controlled as the researcher acted as the facilitator for each experiment. It was recognised that the involvement of the researcher as the facilitator could potentially have disadvantages for the research, for example:

- The researcher needed to be impartial and not impose views on the participants
- The researcher's values and beliefs could become part of the equation

To overcome the above concerns the role of the researcher was clearly defined as:

- Explaining the flow and function of the model and helping the participants to achieve outcomes
- Collecting feedback on the workability and usefulness of the model
- Answering specific questions that may arise related to the tools and techniques used within the model
Once the overall strategy had been developed it was necessary to determine the specific research tactics. An important element of the data collection process was to obtain feedback from the participants concerning the method used, areas of difficulty and opportunities for improvement. The interaction between members of the group was an important factor in obtaining appropriate feedback and it was decided to use a focus group approach to discuss issues as a group rather than just as individuals. It was also useful to use the feedback from the respondents to provide further confirmation of the validity of the design and application of the experiment. To ensure that ethical issues were considered, the researcher would explain to the participants exactly what was happening before and during the experiments and keep them fully informed about the objectives and the outcomes of each experiment.

To carry out the field experiments it was important that suitable organisations were identified and to assist this selection process a number of general criteria were used:

- The organisation was looking to improve performance
- Appropriate individuals were available
- The same people would be available for the duration of the experiment
- The organisation was willing to look at a structured approach
- The organisation would allow the individuals time to participate in the application of the model and feedback their observations
- There was the possibility of testing the model and its effectiveness over time

The above criteria ensured that the organisations released people who could take a full and active part in the focus groups and be of a sufficient level in the organisation to provide meaningful feedback. The problem of experimental mortality, i.e. the loss of subjects from comparison groups was also accounted for in the selection criteria.

More specific information concerning the selection of the individual companies used and detailed descriptions of the experiments conducted is presented in Chapter 6.
3.5 Research Procedures

This section looks at the process used and application of the methodologies discussed previously. The methodologies were described as:

i. Develop a survey questionnaire,

ii. Develop appropriate case studies by in-depth interviewing and elite interviewing.

iii. Develop and test a generic model.

It was now appropriate to construct a more detailed plan of action, which included selection of the target group and the reasons for the selection of this particular group. It was also at this stage that the survey questionnaire was designed and tested with a pilot group of organisations. The survey was targeted at first and second tier automotive component suppliers based in Wales identified from databases supplied by the Welsh Development Agency (WDA) and Business Connect. The automotive industry was selected as it is at the forefront of manufacturing industries regarding the application of world-class tools and techniques. Chapter 4 outlines the selection process and describes in full the reasons for selecting automotive companies in Wales. Eighty companies were contacted through a postal survey and thirty nine (49%) responses were obtained which compares very favourably with an acceptable return rate of 20% quoted by Denscombe (1998). The process used for the development and application of the survey consists of:

- Selection of the survey group
- Preliminary design of the questionnaire
- Pilot
- Revisions
- Sent out
- Analysis and review
The initial survey was piloted with a group of four manufacturing managers who completed the exercise without any assistance or comment. After completion, feedback from the group suggested that some minor alterations should be made to the wording of the initial briefing and to the number and types of initiatives identified. These alterations were introduced before the survey was sent to the target organisations. Chapter 4 gives a fuller description of the process used and the outcomes of the survey exercise.

The case-studies were based on the development of a structured questionnaire. A short pilot exercise was undertaken prior to the questionnaire being used and consequently minor alterations were made to the structure and order of the questions. Chapter 5 describes the development and testing of the questionnaire in more detail.

As described in Chapter 5, three companies were approached and two initiatives were reviewed in each of the organisations. For this exercise it was decided that larger organisations that had experienced a failure and a success when implementing an improvement initiative would be used. Companies were considered from the WDA and Business Connect Database for consideration for the case studies and the final selection was based on the following criteria.

- The companies were accessible and were willing to share information
- The selected companies had attempted to improve through the use of initiatives
- Individuals were available who had knowledge of the initiatives and the results obtained
- The individuals were prepared to spare the necessary time for the interviews and would allow the initiatives to be observed and analysed, where appropriate
- The individuals were able to gather sufficient data to answer the questions posed in the structured questionnaire
- The companies each had experience of one successful and one less successful initiative

Three companies were eventually selected for case study research, Robert Bosch, Tenneco and Ortho Clinical Diagnostics. Phase 2, Chapter 5 provides full details of the design of the structured questionnaire and of the outcome of the case studies.
The development of the model was based on the outcomes of the case studies previously described and the literature review. A pilot, 'gedunken' experiment was undertaken to test the workability and usefulness of the model. The model was further tested through three experiments and these are fully described in Chapter 6.

3.5 Conclusion

This chapter discussed the need for the development of appropriate methodologies, which can investigate the research questions fully. The initial requirement was to determine the overall or strategic approach followed by the development of the specific research tool or tactic.

The selection of the appropriate methodology for each research question was supported by the use of Table 10 and also by undertaking further research into the options available. Strengths and weaknesses of each approach were investigated and also taken into consideration. It was also important that the strategy and tactics developed were realistic and could be undertaken by the researcher within the time scale of the research project.

Table 13: Summary of Methodologies

<table>
<thead>
<tr>
<th>Area</th>
<th>Strategy</th>
<th>Tactic</th>
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<tbody>
<tr>
<td>Phase 1:</td>
<td>Survey of Automotive Companies</td>
<td>Development of one page survey to 80 automotive suppliers.</td>
</tr>
<tr>
<td>Research Question 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 2:</td>
<td>Case Studies</td>
<td>Structured interviews, six case-studies in three companies.</td>
</tr>
<tr>
<td>Research Questions 2 and 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Aim –</td>
<td>Outcomes of case study work and literature</td>
<td>Structured interviews, six case-studies in three companies.</td>
</tr>
<tr>
<td>development of model</td>
<td>reviews.</td>
<td>Use of IMP</td>
</tr>
<tr>
<td>Phase 3:</td>
<td>'Gedunken' Experiments and 3 experiments</td>
<td>Application of the model to theoretical situations</td>
</tr>
<tr>
<td>Model Testing</td>
<td></td>
<td>Application of the model in 3 situations in 3 organisations</td>
</tr>
</tbody>
</table>
Chapter 4 analyses and describes Phase 1 of the research, the survey of automotive companies in Wales. The survey was developed to investigate Research Question 1 and comments and draws conclusions from the results obtained.

Phase 2, the testing of Research Questions 2 and 3 was undertaken using a case study approach. Chapter 5 reports on the case studies and provides further details of the development of the questionnaire used for the interviews and the subsequent outcomes of the research. Ethical considerations were also researched and three fundamental considerations were developed which became part of the research process. A summary of the research methodologies and tactics developed to fully test the research questions are shown in Table 13. The model was based on the outcomes of the case study work and the survey described earlier. Chapter 6 fully describes the development of the model and the pilot experiment and three further experiments undertaken.
Chapter 4
CHAPTER 4 - PHASE 1: SURVEY OF AUTOMOTIVE COMPONENT SUPPLIERS IN WALES

4.1 Introduction and Background

One of the main themes of this research is that manufacturing in the UK appears to have been exposed to a wide range of new initiatives and improvement programmes. Research Question 1 was developed around this theme in Chapter 2. Chapter 3 discussed methodology and the development of the appropriate research strategy and tactics to investigate the research questions identified in Chapter 2. One of the conclusions reached was to use a survey to investigate Research Question 1. This chapter describes the development and use of the survey and comments and draws conclusions from the results obtained.

As discussed, in Chapter 3, a survey was deemed to be the most appropriate methodology to investigate Research Question 1. The survey was designed to gather information in three areas related to the use of modern manufacturing practices in Wales. The main objective of the survey was to record the number of initiatives being undertaken by the organisations being surveyed. A second objective was to investigate the degree of success or failure of selected world class initiatives being pursued and the third objective was to evaluate whether the initiatives were regarded as being ongoing or complete. This chapter will discuss the development of the survey, the selection of the survey group and the results and conclusions from the research.

4.2 Questionnaire Development

The questionnaire was developed as a one-page survey in an attempt to maximise the number that would be completed and returned by the target organisations. It was vital to ensure that even though the questionnaire was relatively short this did not compromise the quality and quantity of data collected. Appendix 2 shows the questionnaire and it was anticipated, from pilot trials, that completion should take no longer than fifteen minutes. Figure 16 shows the process used to survey the automotive companies. A more detailed description of the main activities is provided below.
Brainstorming Session with Managers

Develop list of initiatives

OK?  

Repeat Brainstorming session

YES

Develop Survey

Develop Database

Send Survey to 80 companies in Wales

Not satisfied with initial response

Chase for additional response

Satisfactory response – total of 39 companies after I phonecall

Evaluate Results

Figure 16: Survey of Automotive Companies Process
The initiatives to be included in the questionnaire were developed through a brainstorming session with a group of manufacturing managers, and from reviewing the literature (Schonberger 1996, Euske & Player 1996, Grint 1997, Wallace et al 1994). The brainstorming session was carried out with four senior executives from two companies and facilitated by the researcher. The first brainstorm was related to initiatives in which they had been involved, in their own organisations. A second brainstorm was then performed linked to initiatives that they were aware of but had not necessarily been involved in. The two lists were discussed, together with information from the literature research, and an agreed list of initiatives was developed. From further discussions held with manufacturing specialists and a short pilot study, there was a high degree of confidence that the range of initiatives listed was both relevant and representative and that the questionnaire covered the information pertaining to Research Question 1. One area discussed was the possibility of anomalies in the survey results due to different interpretations of each of the practices. For example Total Quality Management (TQM) in one company could be identified as 'kaizen' in a different organisation. However, further discussions with the manufacturing specialists provided confidence that this would not be a problem as:

- the survey was targeted at Automotive companies and manufacturing managers who were expected to have a good knowledge of improvement techniques
- the objective was to identify the number of initiatives and identifying TQM as kaizen, for example would have no effect on this objective

The scale used on the questionnaire was based on a measurement technique known as a Likert scale (Likert, 1932). A Likert scale normally presents a set of attitude statements and includes a numerical scale, which allows the responses to be expressed directly as a numerical value. This makes it possible to gather quantitative data and make statistical comparisons.

An issue for consideration was whether to use a scale with an odd or even number of points. An odd number of points allows a 'neutral' response to a set of questions, with the central point normally being the neutral place. An even number of response options is normally used when looking at two response options, for example whether something
is good/bad or male/female (bi-polar) and it is necessary to assess the strength of the polarity. This leads to an even number of response options as a neutral response cannot be used. The other issue is how wide the response options should be, a scale of 1 to 3, 1 to 5, or even larger? This depends on the degree of precision required and on how accurately the respondents can distinguish between response options.

The main objectives for the survey were to determine the number of initiatives attempted and secondly to understand the degree of success of each initiative. A neutral response was therefore required to be part of the scale as no neutral response could have led to the respondent not responding to a particular initiative (as it may have been neither successful nor a failure) and thus it would not be registered even though it had been attempted. Thus an odd number of responses was required to cover all eventualities. Three responses lacked the precision required whilst a seven point response would make it difficult to distinguish between the response options. Thus a five point scale was developed for the survey as follows:

1. Total failure
2. Moderate failure
3. Neither a Success or a Failure
4. Successful
5. Highly successful

This scale was designed to fit alongside the list of initiatives developed earlier. Each of the ratings (5,4,3,2,1) was explained in the text describing how to complete the questionnaire. The layout of the questionnaire starts as follows - the full survey is shown in Appendix 2.

<table>
<thead>
<tr>
<th>Improvement Initiative</th>
<th>Success</th>
<th>-</th>
<th>Failure</th>
<th>Completed</th>
<th>Ongoing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just-in-Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TQM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Another area that required discussion and consideration was the type of improvement activity or its size. It can be argued that there could be unfair comparisons between say, for example, kanban and TQM where TQM is generally regarded as an all embracing, forever initiative and kanban is regarded as a shorter term process improvement. It was noted that this could have an effect on the ongoing and completed element of the questionnaire, but it was not considered a major drawback to recording the number of initiatives that had been attempted. Also considered was the possibility that initiatives would be counted within initiatives. For example, kaizen is viewed as an all embracing improvement programme which potentially has elements of other initiatives (for example poka-yoke or SPC) as part of its process of application. This was not regarded as a major issue in that the list of initiatives accurately represented the general confusion that exists in organisations related to the application of improvement processes or initiatives. As discussed in Chapter 2 there is no taxonomy of improvement initiatives which could simplify this process. The selection of the initiatives and the general confusion further substantiates the need for the taxonomy.

Another area of the questionnaire that was considered was whether there should be a timescale against which the number of initiatives that had been attempted was reported. After careful consideration and further research (Waterson et al, 1997) it was decided not to restrict the survey to a time period. The main reasons for this decision were that:

- it was difficult, if not impossible to decide the length of the timescale
- the objective was to determine the total number of initiatives that had been attempted in each organization not the rate of introduction
- most of the manufacturing practices became popular in the UK during the late 1980s and the early 1990s (Waterson et al, 1997)
- it would make the survey more difficult to complete and could reduce the number of surveys returned

However, it was noted that the results from the survey regarding whether an initiative was ongoing or completed could be affected if no timescale was set. However, after due consideration of the previous points, especially the increase in popularity of
manufacturing practices during the late 1980s and early 1990s it was decided not to complicate the survey by including a timescale. Following the design of the survey, a checklist, (Denscombe, 1998:108) was used to evaluate the strengths and possible weaknesses of the survey. The main issue that arose was that the questionnaire was not self contained and would require a covering letter to provide further information to the potential participants in respect of the objectives of the survey. Considering the straightforwardness of completing the survey and the ease of return (fax or using the stamped addressed envelope supplied) and taking into account the information on response rates in Denscombe (1998) it was anticipated that a return rate of at least 30% would be achieved.

4.3 Target Organisations

The target organisations for the survey were all automotive component manufacturing companies in Wales. Studies (for example, Womack, Jones and Roos, 1990) undertaken in the automotive industry demonstrate its pioneering status in developing innovative approaches to the organisation, management and improvement of production. This cutting edge reputation can be traced back to Ford's application of the production assembly line and his company's development of industrial (or production) engineering Sloan's development of the decentralised organisation and Chandler's discussions on the history of the industrial enterprise. (Ford, 1922; Sloan, 1967; Chandler, 1962: 114 – 162). The other reasons for choosing the automotive sector were:

- There were 80 companies identified in the sector and available from the WDA / Business Connect databases.
- Automotive companies tend to be proactive in their use of improvement tools and techniques.
- Automotive companies proactively encourage the use of these tools and techniques throughout their supply (value) chain.
- The automotive sector is still an important employer and contributor to GDP.
Wales was chosen because:

- There is a large, but manageable number (around 80) of automotive companies in Wales.
- There is a broad range of company size within the automotive sector in Wales.
- There are no major car producers in Wales, there are mainly second or third tier component suppliers.
- It was anticipated that the survey respondents could become part of the case study exercises and so a manageable geographical spread was required.

A database was developed from information provided by Business Connect and the Welsh Development Agency (WDA). The developed database consisted of eighty organisations spread across Wales. Each company was provided with a copy of the survey questionnaire (Appendix 2) a covering letter (Appendix 1) and a stamped addressed envelope. The initial target for this information was the Managing Director or Chief Executive at the respective location. It was anticipated that if the Managing Director or Chief Executive could not complete the survey then they would delegate the task to an appropriate individual with the necessary experience to provide a worthwhile response.

The initial response was encouraging with 34 companies (42.5%) responding to the request for information without prompting. A further 15 were given a polite follow up call and of these, a further five responded to the questionnaire. In total 39 (49%) companies responded to the request for information. Appendix 3 shows a typical example of a completed questionnaire.

4.4 Findings

A response rate of 49% for a survey of this nature compared favourably with an acceptable rate of 20% indicated by Denscombe (1998) and an anticipated minimum return rate of 30% discussed earlier. The pie chart – Figure 17 provides an indication of the roles of the respondents.
Over eighty percent of the management representatives were operations or production oriented whilst the non-management individuals consisted of a plant engineer and continuous improvement managers. This compared favourably with the anticipated profile of respondents discussed earlier and justified addressing the survey and covering letter to the Managing Director or Chief Executive at each of the organisations. It was concluded that a relevant cross section of appropriate individuals contributed to the completion of the questionnaire and this provides some confidence in respect of the accuracy and reliability of the results. The size of each of the organisations in respect of the number of people employed is shown in Figure 18.

One company that responded added a significant weight to the average number of employees per company, as this organisation at the time of the survey employed over 8,500 individuals. With this company included in the analysis the average number of employees per organisation was 487 and the range of employee numbers 41 – 8,500, whilst without this organisation the number of employees per company dropped to 265 and the range altered to between 41 and 1400 employees.
Further analysis of Figure 18 shows that approximately 55% of the companies employed less than 200 people, whilst around 60% employed less than 300. Only 5% of the organisations reviewed employed more than 1000 at the location analysed.

4.5 Analysis and Results
The fully collated results from the questionnaire are shown in Appendix 4. The spreadsheet format allowed convenient and speedy updating when further information was received. Appendix 4 shows the scores for each individual organisation and also provides totals of initiatives started per company and in total and average scores per company together with the percentage of initiatives attempted per company and in total. Analysis of the data was conducted in a number of areas, based on the data tables in Appendix 4 and a number of interesting results were obtained.
Figure 19: Values Attributed to Initiatives

Figure 19 illustrates the percentage of companies, which attributed particular scores to each of the initiatives undertaken. Seventy percent of the scores that were recorded for the initiatives were ranked as a 3 or 4. Seventeen percent of the scores were a 5, whilst approximately forty percent of the scores were 3 or under. The average score per company for initiatives undertaken was 3.64 with a range of 2.65 to 4.35.

Judging these results against the scale on the survey questionnaire, that is: 5 highly successful, 4 successful, 3 neither a success nor a failure, 2 moderate failure, 1 total failure, then it can be observed that 42% of the initiatives were ranked as not successful or lower and 71% were rated as successful or neither a success or failure. Only 17% of the initiatives attempted were regarded as highly successful whilst 42% of the respondents recorded that the initiative was successful.
The next factor that emerged from the survey, the number of initiatives attempted by each of the companies, is illustrated in Figure 20.

**Figure 20: Initiatives attempted per company**

A total of eighteen initiatives were listed on the questionnaire. One organisation added a further initiative (Gemba Kanri). On average over 72% of the initiatives were attempted per company. Fifteen companies (39%) attempted 16 or more initiatives whilst only eight companies (20%) attempted 9 or less initiatives. The average number of initiatives attempted per company was 13 (12.97) and the range varied from 4 to 18 initiatives.

Figure 21, shows the average or mean scores for each company linked to the number of initiatives attempted. As indicated earlier the average score was 3.64. Interestingly the graph shows that the highest average scores are grouped around companies that attempted between 7 and 12 initiatives with the 7 to 9 grouping being the highest scoring area overall.

The other three groups all scored below average. This indicates that of the organisations surveyed, those attempting between 7 and 12 initiatives were more successful at implementing them than organisations that attempted only a very small number (less than 6) and those that attempted 13 or more.
Table 14 was developed to examine the relationship between a number of variables. These are the number of initiatives attempted, against their mean 'success – failure' score, average company size (employees) and range (employees) in which the organisation fits.

**Table 14: Comparison Of Key Data From Survey**

<table>
<thead>
<tr>
<th>Number of Initiatives attempted</th>
<th>Mean Score</th>
<th>Average Size (Employees)</th>
<th>Range (Employees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 - 18</td>
<td>3.61</td>
<td>329</td>
<td>90 – 1400</td>
</tr>
<tr>
<td>13 – 15</td>
<td>3.60</td>
<td>518</td>
<td>230 – 1400</td>
</tr>
<tr>
<td>10 – 12</td>
<td>3.66</td>
<td>237</td>
<td>49 – 380</td>
</tr>
<tr>
<td>7 – 9</td>
<td>3.76</td>
<td>163</td>
<td>50 – 381</td>
</tr>
<tr>
<td>4 – 6</td>
<td>3.59</td>
<td>162</td>
<td>41 – 245</td>
</tr>
</tbody>
</table>

It is tempting to conclude from Table 14 that the optimum company size for introducing initiatives successfully is between 49 and 381 employees, a relatively wide range, or more specifically between 163 and 237 employees. In respect of the survey undertaken this conclusion is valid but it would be inappropriate to apply this as a broad principle as the range of employee numbers within the survey and number of companies reviewed is insufficient. However, it is interesting to note that larger companies generally attempted more initiatives but with a lower success rate.
Table 15: The Success and Popularity of Individual Initiatives.

i. The four most successful initiatives:
1. Failure Modes and Effects Analysis (FMEA) 4.03
2. Kanban 3.97
3. Lean Manufacturing 3.88
4. JIT & Kaizen 3.83

ii. The four least successful initiatives
1. Theory of Constraints 2.50
2. Total Productive Maintenance (TPM) 3.12
3. Business Process Re-engineering (BPR) 3.14
4. Benchmarking 3.16

iii. The most popular initiatives
1. FMEA 92.30%
2. Kaizen 89.74%
3. Lean Manufacturing 87.18%
4. Statistical Process Control (SPC) 84.62%

iv. The least popular initiatives
1. Theory of Constraints 30.77%
2. BPR 35.90%
3. Taguchi 46.15%
4. Supplier Integration 64.10%

v. Percentage* of initiatives completed and those ongoing:
15% complete
72.8% ongoing

*Note that this does not add up to 100% because not every company that responded to the questionnaire answered this question.

Table 15 was developed to illustrate the success and popularity of the individual initiatives and the percentage completed against those ongoing. The table is split into five sub-sections and a number of interesting observations can be made.

Firstly, the most successful and popular initiative was Failure Mode and Effects Analysis, probably due to its relative simplicity, ease of use and also that it was one of the stipulated requirements set by The Ford Motor Company for approved supplier status. Conversely the least successful and least popular initiative was Theory of Constraints,
which had no major organisational stipulation to drive it through the supply chain and is also more conceptual and difficult to apply than many of the other initiatives attempted.

A further observation from Table 15 is that 15% of the initiatives attempted were regarded as complete. Interestingly, further analysis of the results showed that 60% of the completed initiatives scored a 4 or a 5 whilst only 12% scored a 1 or a 2. Thus the majority of the initiatives were completed and finished because they were regarded as successful and not necessarily because they had failed.

Table 16 shows the percentage of companies that started each initiative and were continuing with it when the research was undertaken – Column 1. In the second column is the percentage of companies that started the particular initiative. The third column was produced by multiplying columns 1 and 2 together to obtain the percentage of companies continuing with a particular initiative against the number of companies in the survey. Theory of Constraints was the least tried initiative (30.77%) and was ongoing in only 25% of the companies surveyed. Thus only 7.69% of the companies surveyed were currently pursuing theory of constraints.

Table 16: Initiatives Currently Ongoing – Top Four Highest Percentage Score

<table>
<thead>
<tr>
<th>Initiative</th>
<th>% ongoing that started initiative</th>
<th>% that started initiative</th>
<th>% ongoing based on total no. of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kaizen</td>
<td>88.57%</td>
<td>89.74%</td>
<td>79.48%</td>
</tr>
<tr>
<td>2. Lean Manufacturing</td>
<td>82.35%</td>
<td>87.18%</td>
<td>71.79%</td>
</tr>
<tr>
<td>3. 5s</td>
<td>84.38%</td>
<td>82.02%</td>
<td>69.20%</td>
</tr>
<tr>
<td>4. SMED</td>
<td>83.33%</td>
<td>76.92%</td>
<td>64.09%</td>
</tr>
</tbody>
</table>

4.6 Conclusions
The survey provided a snapshot of the current use of improvement initiatives within the Automotive sector in Wales. FMEA, Kaizen, Lean Manufacturing & Statistical Process
Control (SPC) were recorded as the most popular initiatives and, with the exception of SPC, these were also included amongst the top four most successful initiatives. SPC ranked 7th overall.

At the opposite end of the popularity scale, Theory of Constraints, Business Process Re-Engineering (BPR), Taguchi and Supplier Integration were recorded as the least popular initiatives. Again, Theory of Constraints and BPR were two of the four least successful initiatives, Taguchi scored 3.17, which was .01 of a percentage point higher than benchmarking, and Supplier Integration scored 3.52 which was well below the average value of 3.64. If an initiative is unpopular it is likely to be unsuccessful and also if it is unsuccessful then it will most probably be unpopular - a cycle of failure.

The average number of initiatives attempted per company was 13 (12.97), and the range varied from 4 to 18 initiatives. This statistic suggests a number of potential issues:

- A lack of understanding of the commitment required
- A lack of understanding of the long-term nature of these initiatives and the desired outcomes
- Initiatives being forced through the supply chain by the major car manufacturers
- No strategic approach to the introduction of these initiatives, initiatives introduced as flavour of the month on an ad hoc basis
- A general lack of understanding of how to implement the initiatives
- A combination of all the above.

On a positive note the number of initiatives attempted could indicate a genuine desire by the respondents to try new ideas and opportunities in an attempt to improve their organisation.

4.7 Discussion and Further Work

4.7.1 Representativeness and Reliability

The main aim of the survey was to determine the extent of use of selected improvement initiatives within the automotive sector in Wales. The response rate of 49% is quite high for a survey of this nature and helps to add some credibility to the results. A review of the roles of the respondents, Figure 17, provided further credibility to the validity of the
responses as described in Section 4.4. The profile of respondents was at an appropriate level of seniority and also respondents were mainly production or operations oriented. These factors provided a degree of confidence in the accuracy and reliability of the results. Also the results obtained, regarding the number of initiatives attempted, were consistent with the study undertaken by Waterson et al (1997) in which twelve practices were evaluated. This study concluded that:

The overall pattern is clear: most of the practices are relatively recent, having been introduced during the 1990s in particular, more than 75% of initiatives in the areas of BPR, Empowerment, Learning Culture, TQM and Team-Based Working started during this period. It is apparent there has been a high level of activity in these areas during the 1990s. (italics added)
(Waterson et al 1997:16)

The scores recorded for individual initiatives need to be treated with caution as it is possible that respondents might have presented a too positive picture because of their personal involvement in the improvement process and also their desire to portray a relatively positive picture of their own organisation. However, even if such bias occurred it would have little, if any, effect on the numbers of initiatives being pursued and little effect on the findings regarding the relative success of each initiative when compared with each other.

4.7.2 Implications for the Research

The findings from the research revealed that an average of thirteen initiatives were attempted per company, with 39% attempting more than 16 initiatives. This backs up much of the literature, which suggests that there has been a significant increase in the numbers of initiatives that have become available to, and attempted by, organisations during the late eighties, early nineties. The high number of initiatives attempted also tends to suggest that initiatives are being introduced as a quick fix rather than as part of an overall strategic approach. This leads to the observation that the introduction of improvement initiatives would benefit from a process, which will assist organisations in the selection of appropriate initiatives and which supports a sustainable improvement business strategy. Interestingly Theory of Constraints, which is a process that could be
used to help organisations to focus on their key constraints, was the least successful and least popular initiative.

Two other interesting points emerged from the research. The selection or choice of a suitable initiative and how it relates to its sustainability. It can be concluded that the more suitable an initiative the more likely it is to gain support. Figure 22 shows the relationship between sustainability and success of an improvement initiative.

\[ \text{Degree of organisational congruence} \rightarrow \text{Degree of strategic conformance} \rightarrow \text{Degree of suitability of initiative} \rightarrow \text{Likelihood of resources being devoted to supporting the initiative} \rightarrow \text{Sustainability} \rightarrow \text{Degree of success} \rightarrow \text{Popularity} \]

+ represents a positive influence
- represents a negative influence

Figure 22: Sustainability – Success Systems Diagram
Figure 22 suggests that the degree of sustainability of an initiative is related to the degree of strategic conformance and how well it fits the organisation—its degree of organisational congruence. Three factors contribute to the likelihood of resources being devoted to the initiative, the degree of suitability of the initiative, the number of initiatives being attempted, six is believed to be an optimum figure from the survey results and the popularity of the initiative. Popularity is dependent on success and organisational congruence. The bottom loop on Figure 22 is a self-perpetuating positive cycle as success leads to popularity, which leads to further resources being devoted to the initiative, which supports its sustainability.

To sum up, the findings from the survey suggest that individual companies are attempting to introduce too many initiatives, which are possibly even in conflict. It is highly probable, but not irrefutable, that inconsistent, non-congruent, manufacturing/business policies or strategies have helped to drive this. It is appropriate to comment, at this stage, that the outcomes of the survey provide a positive response to Research Question 1—the main evidence being the high number of improvement initiatives attempted.

4.7.3 The Next Steps
The testing of Research Question 1 was successfully undertaken through the completion of the survey of automotive suppliers, as described in this chapter. The next phase of the research was to test Research Questions 2 and 3 and to then develop a model for sustainability.

In Chapter 3, it was determined that case study research was the most appropriate and relevant methodology to investigate Research Questions 2 and 3. The case study research utilised a structured questionnaire, in-depth interviews and observations. The case studies and their outcomes are described in Chapter 5.
Chapter 5
CHAPTER 5 – PHASE 2: THE CASE STUDIES

5.1 Introduction

This chapter discusses how Research Questions 2 and 3 were investigated and also presents information related to the research aim of developing a model to support and sustain business improvement. The aim of the case studies was to develop a greater degree of detail, through the use of a questionnaire and semi-structured interviews that would answer Research Question 2 and Research Question 3 and provide information to develop a sustainable improvement model. The case studies were undertaken in three organisations each of which had attempted two initiatives – one regarded as successful and the other not as successful.

The questionnaire was designed to support the case study research and the interviews. It was based on information developed from the secondary research and was designed to ensure a consistent approach to the collection of the case study material. The full version of the questionnaire is shown in Appendix 5. The questionnaire consisted of the following categories of questions:

Questions 1 – 4: Background information
Question 5: Performance measurement
Question 6: Investment required information
Question 7: Achievement of Goals
Question 8: Changes that resulted
Question 9: Process used
Question 10: What would be done differently?
Question 11: Companies opinions of success of initiative
Question 12: Further comments

Evaluation sheet: Used as an interview prompt and guide.
5.2 Development and Application of the Questionnaire

The questionnaire was developed to take stock of how the initiatives were undertaken, what went wrong, what went right and the company's opinion of whether the initiative was successful or not. A further requirement was to determine what, if anything would be done differently if the initiative were re-launched or a similar initiative undertaken.

A number of companies were considered from the original WDA database, Business Connect database and other sources for the case studies and the final selection was based on the following criteria.

- They were accessible and were willing to share information
- They had attempted to improve through the use of initiatives
- Individuals were available who had knowledge of the initiatives and the results obtained
- The individuals were prepared to spare the necessary time for the interviews and would allow the initiatives to be observed and analysed, where appropriate
- The individuals were able to gather sufficient data to answer the questions posed in the structured questionnaire
- The companies each had experience of one successful and one less successful initiative

After approaching a number of organisations and comparing them against the above criteria, three companies were eventually selected for the case study research. These three companies were Robert Bosch, Tenneco and Ortho Clinical Diagnostics. Interestingly two of the companies were from the automotive sector whilst the other, Ortho Clinical Diagnostics was from the pharmaceutical sector. This was an opportunity to broaden the research and provide a contrast to the automotive sector. The results of the case study research are analysed in detail in the next section.

The questionnaire was used to guide semi-structured interviews with selected individuals from the three organisations, Bosch, Ortho Clinical Diagnostics and Tenneco in order to provide information for the case studies. The main activity was to interview the senior project leader, or equivalent, for each of the initiatives using the questionnaire as a
guide. The objective of this research was to develop a sustainable improvement model and it was necessary to obtain feedback regarding the degree of success of the initiative and the commitment from the management team at a management, or at least the senior project manager for the initiative, level to obtain relevant information.

In depth, semi-structured interviews, using the questionnaire, were carried out at the sites with the identified individuals. It was helpful that the interviewer is experienced in interviewing techniques and has a good general understanding of improvement tools and techniques. It was also critical that, when using the questionnaire, the interviewer did not impose personal views or preferences onto the interviewee. However, the nature and design of the questionnaire required the interviewer to make suggestions during the interview to clarify the questions and to act as a prompt to the interviewee.

It is important to record that the interviewer had previous prior knowledge of each of the organisations and was well known to the interviewees. This helped to create a climate of openness in which success and failure could be discussed frankly. A further analysis of the progress of each of the initiatives was carried out through informal discussion with other staff and through investigation and observation of each of the initiatives in action, where appropriate. The process was as follows:

- Semi structured interview, using the questionnaire, with the Senior Project leader for each initiative
- Discussion with representatives of the management team – if possible
- Observation of the improvements in action – if applicable
- Review of performance measures related to the success (or failure) of the initiative

The questionnaire was designed as a guide to facilitate a semi-structured interview with each of the project managers / leaders. The questions were developed to assess the degree of success and sustainability of each initiative. The questionnaire was designed to capture the opinion of the project leader as well as supporting information that could
help to determine the success or failure of the initiative and possibly be used for comparison purposes. For example, question 5 looks at the measures used to monitor the initiative and their change over the duration of the initiative. This helps to determine whether there was any improvement in performance. It was also useful to determine whether the objectives defined for the initiative aligned with the performance measures and questions 4 and 5 were designed to investigate this. Question 6 was an attempt to measure the investment required and also, indirectly, to estimate the degree of commitment to the initiative. Question 7 was used to measure the relative degree of success against common goals that were developed from the literature by the researcher as useful indicators of success, also the opportunity to add more goals was provided. Question 8 was used to measure, indirectly, the degree of success of the initiative regarding its effect on performance improvement through change.

Question 9 investigated the process used to introduce the initiative and was an open question designed to gather information from the interviewee’s experience regarding how they would improve the implementation process if undertaking a similar exercise in the future. It was an attempt to ‘learn from the experience’ of the interviewee. Question 11 was included to attempt to obtain the interviewee’s opinion on whether they regarded the initiative as being successful or not. Any further comments that the interviewee wished to add were invited in question 12.

The questionnaire was designed to be used within the context of a semi-structured interview, which allowed a clear list of issues to be addressed but also gave the interviewee scope to develop their responses, if necessary. The skill of the interviewer is required to ensure the topics are covered and the questions answered. Also the need for an impartial, unbiased approach is vital. A checklist (Denscombe, 1998:121) for preparing for an interview was useful as a guide and helped the interviewer to prepare for each interview.

It was neither feasible nor necessary to carry out a full pilot interview to test the questionnaire. Subsequently, the questionnaire was tested by review and discussion.
with two manufacturing managers who read the questionnaire and were asked to comment on:

- The relevance and wording of the questions
- The general content of the questionnaire

The feedback from the review was positive and no major issues were raised. One question was re-worded for clarity (Question 7) even though this was not regarded as a major issue as the questionnaire was being used to facilitate an interview rather than as a separate survey to be completed by individual respondents. Question 8 was also discussed in some depth regarding the changes that were likely to occur due to the introduction of an improvement initiative. Both managers felt that the content of the questionnaire was relevant and appropriate and the use of open questions allowed appropriate input by the interviewee when necessary. The process used to gather information for each of the initiatives, within the participating companies was:

1. Background information: tour of the site and observation of the initiative with a member of the management team as follows:

   Robert Bosch: Manufacturing Manager
   Tenneco: H.R. Manager
   Ortho Clinical: Manufacturing Manager

2. Semi structured interviews were held with the appropriate project leaders at each of the sites as follows:

   Robert Bosch, Lean Project Manager
   Robert Bosch, TPM TPM Project Co-ordinator
   Ortho Clinical, Cell Manufacturing Manager
   Ortho Clinical, Pull system Special Projects co-ordinator
   Tenneco, kaizen HR Manager
   Tenneco, kaizen HR Manager

An example of a completed structured interview is shown in Appendix 6. Section 5.3 describes the case study research in detail.
5.3 The Case Companies

This section describes the six case studies that were carried out in the three companies using the approach described earlier. The format of the report on each case study generally follows the order of the categories of questions in the questionnaire.

Research Case 1: Robert Bosch

Introduction to the Company

Robert Bosch founded the Robert Bosch organisation in 1886 with an early focus on quality engineering, enlightened employment practices and a desire to grow the business into a multinational organisation. He died in 1942 and in his will gave 90% ownership of the company to a charitable trust - The Robert Bosch Foundation - and 10% ownership to the Bosch family. The outcomes of this decision were as follows:

- The philanthropic objectives of the Robert Bosch Foundation were secured
- Investment in research & development, capital equipment and training & development was to take priority over dividends
- The company is not listed on any stockmarket

Bosch is split into the four sectors shown in Table 17, and includes household names such as Neff, Blaupunkt and Bosch-Siemens.

The Bosch plant in Wales started production in Cardiff in 1991 and was established for a number of reasons. These included the availability of a highly skilled, quality conscious workforce, significantly improved industrial relations, a highly supportive government infrastructure - Welsh Office, Welsh Development Agency, County Councils - and unit labour costs, productivity and quality which were considered capable of being world class.
Table 17: Sector Split at Bosch

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sales</th>
<th>Typical products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Equipment</td>
<td>61%</td>
<td>Alternators, ABS, Lighting, Electric Motors, Semi-conductors &amp; Electric Control</td>
</tr>
<tr>
<td>Communications and Technology</td>
<td>11%</td>
<td>Car phone systems, Traffic Information systems, Car audio, Location &amp; navigation systems, Satellite &amp; Mobile Radio</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>24%</td>
<td>Household Appliances, Kitchens, DIY, Tools.</td>
</tr>
</tbody>
</table>

The factory is located on a 200 acre greenfield site on the outskirts of Cardiff. Bosch has invested over £117 million at the Cardiff location, which currently employs around 1300 people. The investment has been used to produce a new type of alternator for the automotive market, called the compact, which can generate more electrical power for less weight and is smaller in size than previous models. The manufacturing process is highly automated and makes extensive use of specialised Bosch industrial automation equipment to produce an alternator every five seconds - current output levels being about 12,000 per day. At full production the plant has a capacity to produce 5 million alternators per annum. A schematic layout of the manufacturing facility is shown in Figure 23.

Production started in February 1991 and the 10 millionth alternator was produced in December 1995. The Cardiff plant is part of the K9 division that has its headquarters in Schwieberdingen, Germany and other manufacturing facilities at Hildersheim and in Spain. The K9 division has responsibility for the design, development and worldwide sales of starter motors and alternators. It successfully achieved ISO9001 accreditation in October 1995 and Cardiff also achieved QS9000 accreditation in 1999.
The company has a background of process improvement initiatives providing training and support in techniques such as Statistical Process Control (SPC), Single Minute Exchange of Dies (SMED), Poka-Yoke, Problem Solving Methodologies and Concepts through the application of teamwork using Continuous Improvement Teams (CITs) and Bosch Improvement Teams (BITs).

A significant quality performance indicator for the site is the number of zero-kilometre failures. A zero kilometre failure is an alternator that has been sent to a customer and fails to operate, or is the wrong specification. The aim is to reduce zero kilometre failures from a level of 170 ppm for 1995 to an eventual level of below 10 ppm over each one year period. This would compare favourably with the current, best in class, quality performance of Bosch's main competitors.
Bosch at Cardiff has developed its own site values that fit with the philanthropic aims and corporate objectives of the corporation and underpin everything they do in running the local operation. These are:

- Commitment to total quality
- Strong emphasis on training & development - to achieve continuous improvement and to grow careers, not just jobs
- Meet our social responsibilities - to customers, employees, local community and suppliers
- Single status organisation, to the greatest extent possible
- Organisational climate to encourage open communication, minimise hierarchy, invite involvement and partnership, create enjoyment
- Focus on the individual
- Responsive organisation - through flexibility and teamworking
- Long-term commitment to Wales

Following initial discussions against the criteria described in the previous chapter and further discussions with the company, two initiatives were studied, Lean Manufacturing and Total Productive Maintenance (TPM).

The Initiatives

I. Lean Manufacturing

The term Lean Manufacturing came into circulation in the 1990's following the publication of *The Machine that Changed the World* (Womack et al, 1990) and is based on research into the Toyota Production System (TPS). The idea is to manage product flow from raw material to end customer with an overall objective of eliminating non value added activities (waste) from this process. The benefits of successfully implementing Lean Manufacturing concepts are claimed to be defect-free products, on-time delivery, significant reductions in inventory and freed up people, machine time and space.
The Lean Manufacturing initiative was launched at the Cardiff site in early 1997. A project manager was appointed and the initiative was supported by corporate goals to reduce complexity, through simplifying processes and reducing waste in the order fulfilment process. The initiative was expected to be ongoing and the specific objectives 'agreed' for the Cardiff site by corporate management were to:

- Reduce stock
- Reduce manpower (increase output per person)
- Reduce total lead time
- Reduce changeover times
- Improve customer response time (Final Assembly)

Initially a senior manager was appointed, as the project manager, to set up and drive the initiative on a full time basis. However, in early 1999 he left the company and responsibility was transferred to the current post holder. The development of Lean Manufacturing commenced with a pilot initiative that was undertaken in the line-side stores area. This was an attempt to introduce Lean Manufacturing principles in an identified area and support the long term objective of improving the order fulfilment process.

**Introducing the Lean Manufacturing Initiative**

The introduction of the Lean Manufacturing initiative commenced with half day awareness raising sessions for approximately seventy five employees in two areas (rectifier and rotor). Following this a half-day overview was included on the one-week BEST course and a further 140 people were trained. The BEST course was run by in-house trained facilitators and was developed to provide an overview of improvement tools and techniques, world-class manufacturing and to discuss and resolve issues related to the company culture and management style. Also twenty five managers and group leaders were provided with a one-day awareness session. No team was allocated to the project manager to support the introduction of the Lean Manufacturing improvement activity. This tended to suggest a lack of support towards the on-going,
long term success of Lean Manufacturing from the site senior management team when compared with the much more structured approach developed for the TPM initiative described later.

The pilot initiative was used to prove that the initiative was workable through a bottom up approach. An investment of £75,000 was provided for lineside racking. In terms of manpower one person was provided for approximately two days per week (40% of the time) and a four-person project team was available for approximately ½ day per week (10%). Generally speaking the pilot was deemed to be relatively successful by the interviewee.

**Feedback related to specific areas of the structured interview**

The structured interview was used to collect data and the following discussion summarises the data collected. Question 5 of the structured questionnaire asked about the measures that were used to monitor the initiative. It appeared that there were clear, well-defined objectives as described above but it was interesting that performance measurement was less convincing as indicated in Table 18. Analysis of Table 18 reveals that on three of the performance indicators identified there were no actual measures of improvement available.

**Table 18: Measures of Performance - Bosch**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unit</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total stock levels</td>
<td>No. of days</td>
<td>No measures available</td>
</tr>
<tr>
<td>Stock levels per sub assembly</td>
<td>No. of days</td>
<td>No measures available</td>
</tr>
<tr>
<td>Floor space</td>
<td>Pallets</td>
<td>- 35 m² (in stores area)</td>
</tr>
<tr>
<td>C/over times (Rectifier)</td>
<td>Mins.</td>
<td>From 120 mins. To 3 mins.</td>
</tr>
<tr>
<td>Raw material stock</td>
<td></td>
<td>-14% (25%, four year target)</td>
</tr>
<tr>
<td>WIP</td>
<td></td>
<td>- 6% (24%, four year target)</td>
</tr>
<tr>
<td>Movements from stores to line</td>
<td>No measures available</td>
<td></td>
</tr>
</tbody>
</table>
Table 18 confirms that performance measurement is generally patchy. Many of the reductions quoted, for example –14% raw material stock were informed estimates rather than easily available measures.

Meeting goals

Question 7 of the structured questionnaire asks for feedback in respect of how the initiative contributed to the achievement of the six pre-set goals, shown in Table 19, and to list any further goals that were identified and their degree of accomplishment. Interestingly the pilot initiative was ranked as 100% successful in the achievement of five of the six goals listed. The pilot was not ranked against the goal of enhancing the organisation’s ability to compete in the future, as it was felt by the interviewee to be inappropriate to the pilot. This raises doubts, in itself, regarding the long term commitment of the management team to the initiative. The company wide approach was ranked as 58% successful in achieving the same goals shown in Table 19.

Table 19: Question 7, pre-set goals

<table>
<thead>
<tr>
<th>7. How well did the initiative achieve the following goals?</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translate specific business objectives into concrete action</td>
<td>X</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Align people towards a common objective</td>
<td>X</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Produce measurable improvement/s – short term gains</td>
<td>X</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Produce measurable improvement/s – long term gains</td>
<td>X</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Drive improvements in business processes</td>
<td>X</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Enhance the organisation’s ability to compete in the future</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL

1 = no success  
2 = some success  
3 = reasonable success  
4 = very successful

Note: ✓ represents feedback for the ‘Pilot initiative’ whilst X represents the effect on the business.
Other Changes

Question 8, of the structured questionnaire, related to other changes (improvements) and their relative success, which resulted due to this initiative. These were again ranked against pre-set criteria as shown in Table 20.

Table 20: Question 8, pre-set changes

<table>
<thead>
<tr>
<th>8. What other changes resulted due to this initiative?</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural changes – innovation, improvement based?</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>People became empowered – not afraid to take risks</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Managers moved towards a coaching/facilitation style</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>A broader range of performance measures were introduced</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Performance measures were re-aligned with the strategy</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>The initiative changed the ‘way we do business’</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

This worked out at a 50% success rate for the changes identified in Table 20. The interviewee added three additional changes:

- Project leader given added authority
- Awareness of customer requirements
- How we [Bosch] need to change to meet them [customer requirements]

The overall percentage success rate increased to 59% when these three additional changes were included.

What would be done differently?

Question 10 of the structured questionnaire asked what, if anything, would be done differently if a similar initiative was introduced into Bosch, or the same initiative was introduced into a different organisation. In other words, what were the lessons learned? A number of areas were identified that could improve the introduction of this initiative:
• The initiative has to be sold to the management team at the outset (commitment)
• The outcomes and achievements need [measures] to be discussed with the management team
• There needs to be education of the senior management team
• A pilot to prove should be undertaken at an earlier stage

Further Comments
A number of further points were discussed, in respect of the further development of the Lean Manufacturing initiative, and these are summarised as:

• move from a function driven to a process driven business
• there is a need to sharpen up and become more customer focused
• more focused measures are required

Interestingly when asked if the initiative was a success (in her opinion) the interviewee responded by saying yes for the pilot but was uncertain for the company wide initiative.

ii. Total Productive Maintenance
The overall goal of Total Productive Maintenance (TPM) is to maximise equipment effectiveness through preventative maintenance carried out by all employees through small group activities. TPM, in general, has a double goal – zero breakdowns and zero defects. The rationale being that when breakdowns and defects are eliminated, equipment operation rates improve, costs are reduced and productivity increases. TPM was first considered, by the Cardiff site, in 1996 and it was decided to launch the initiative in 1998 through the use of a pilot programme. A full time TPM co-ordinator was established and five full time TPM facilitators were appointed, one for each of the assembly lines shown in Figure 23. A part-time steering committee consisting of 5 senior managers (one of whom was the TPM co-ordinator) met on a monthly basis to evaluate progress. A cross functional management team meeting consisting of the remainder of the management team met on a three monthly basis to discuss progress and issues that had arisen. The steering committee reported to the management team.
Policy decisions were agreed at the management team meetings and these were actioned by the steering committee. The scope of the project was to develop TPM across the whole of the Cardiff site. The initiative is ongoing and the main objectives defined by the team are to:

- increase output in line with increasing demand by improving equipment utilisation
- get the machines running more effectively and reliably.

These objectives appear to be rather broad and woolly but they were supplemented by the performance measures listed in Table 21.

**Table 21: Performance Measures used on the TPM Initiative**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unit</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Utilisation</td>
<td>%</td>
<td>improved from 75% to 82%</td>
</tr>
<tr>
<td>• Productivity (Value Added)</td>
<td>%</td>
<td>increased from 4% to 7%</td>
</tr>
<tr>
<td>• Spares Usage</td>
<td>£</td>
<td>reduced from £3.5 to £2.96m</td>
</tr>
<tr>
<td>• Safety</td>
<td>no. of accidents per 100,000 hrs worked</td>
<td>reduced from 25 to 20</td>
</tr>
<tr>
<td>• Maintenance hrs.</td>
<td>expected against achieved</td>
<td>improved from 70% to 85%</td>
</tr>
<tr>
<td>• Review against internal TPM team improvement targets</td>
<td></td>
<td>All internal site measures were achieved</td>
</tr>
</tbody>
</table>

The performance measures in Table 21 were benchmarked at the beginning of the project and are being maintained and reported as an ongoing exercise. In contrast to the measures used for the Lean Manufacturing initiative (Table 18) these measures were readily available and were recorded, published and analysed on a regular basis. Bosch uses other measures, for example quality is measured using parts per million defects, to monitor the production process. However, the measures selected to indicate the relative success of TPM are those shown in Table 21. Utilisation is recognised as one of the key measures of the plant’s performance and a target of 85% has been set. Utilisation is an important measure as the manufacturing process is running 24 hrs per day 365 days of the year, discounting planned maintenance. In order to achieve the maximum output of alternators it has been recognised that the uptime, or utilisation, is a fundamental deliverable. The improvement indicated above, from 75% to 82% is
significant and is mainly a result of the TPM initiative. The reduction in spares usage was also significant and directly attributed to the successful introduction of TPM. These improvements did not come without investment, from Bosch, in five full time line facilitators, one full time co-ordinator and over fifty, one-day awareness raising workshops for over 500 people on site. Investment was also made in an external training programme for the TPM co-ordinator and the team of five line facilitators at a programme cost of £2,000.

**Meeting goals**

Question 7, of the structured questionnaire, asks for feedback in respect of how the initiative contributed to the accomplishment of six pre-set goals as shown in Table 19, and to list any further goals that were identified and their degree of accomplishment. Against the six goals shown in Table 19 the project leader ranked the initiative as being 83% successful. A further six company specific goals identified for the TPIVI initiative by the management team and the steering group are reproduced in Table 22.

**Table 22: Additional Goals set for the TPM Initiative**

- Develop a positive impact on rework free manufacture
- Improve safety performance
- Reduce zero kilometre failures
- Impact on establishing 5S
- Establish a link between TPM and central stores
- Introduce TPM in the office

The degree of success ranked against the six additional goals listed in Table 22 was 79%. Overall against the six pre-set goals and the additional six goals identified by the company the ranking was 81%. They ranked themselves as being very successful (4 out of 4) in aligning people towards a common objective and enhancing the organisation's ability to compete in the future which were two of the pre-set goals. One of the comments made was that over 96% of the people within the Cardiff site were aware of TPM. The lowest ranking goal, which they had set themselves, was for TPM being introduced in an office environment (50% success).
Other Changes

Question 8 of the structured questionnaire, related to improvements or other changes that had resulted from the initiative. It was recognised from discussions with a number of employees and the project leader that considerable change had been introduced that was linked to the TPM project. Of the six changes suggested by the questionnaire, (see Table 20) two were ranked as being significant:

- Cultural changes – innovation, improvement based
- The initiative changed the ‘way we do business’

The organisation listed a further seven changes, Table 23, that had taken effect due to the TPM initiative,

Table 23: Further Changes From the TPM Initiative

- Ownership of equipment by manufacturing team
- Morale improved
- Improvement in general skill levels at technician & operator level
- More maintenance tasks taken on board by the operators
- Technicians released for key jobs
- Reduction in firefighting
- Reduction in breakdowns

Six of the seven changes shown in Table 23 were ranked as significant. The majority of changes listed by the company were specific to the initiative, for example reduction in breakdowns, but they also suggested that there had been a quite noticeable improvement in overall morale especially amongst the shop floor operators.

Process used to introduce the initiative

The project was introduced in a structured way through the appointment of a full time coordinator and six full-time line facilitators. There was strong evidence of top down
commitment and involvement. Activity was mainly from the bottom up and this is normally the case with a TPM initiative. An important role identified during the discussion was the support of the Continuous Improvement Team to the TPM coordinators in setting up and helping to facilitate the one-day workshops. The Continuous Improvement Team are a team of full-time, trained facilitators who support identified initiatives by providing expertise in problem solving tools and techniques, project management and administrative support if required. The Continuous Improvement Team was not made available to the Lean Manufacturing Pilot initiative, in the Line side stores, described above.

What would be done differently?

Question 10, of the questionnaire asks what would be done differently if this initiative or a similar one was re-launched. Discussion with the project leader and with Bosch employees resulted in the following suggestions:

- Ensure that a budget for training the co-ordinator and facilitators is available at the start of the initiative
- Train the facilitators in greater depth, over a three month period
- Give broad training on world class manufacturing techniques (typically 5S, Statistical Process Control and Poka-Yoke) to the facilitators at the start of the programme and on an ongoing basis – as and when required
- Nominate team leaders to be TPM champions, train them and support them by giving them time to introduce new techniques and technical/moral support when necessary
- Ensure that the support infrastructure, for example the two committees described below are in place and maintained
Further comments

A number of further ideas were suggested from the interview with the Project Leader:

- Initially a part-time senior management steering committee was set up which met on a monthly basis. This had fallen into disarray but there were plans in place to re-establish this committee as soon as possible.
- The cross functional management team meeting, held every three months needed to be re-established
- Start small and build on success appears to be a successful formula
- Top management support is critical, 'you will do it' was a key driver from top management
- Continual feedback of measures and ongoing targets and feedback on achievement are essential

Finally, when asked if the initiative was a success the Project Leader responded with a resounding – yes. The results recorded against the measures in Table 21 and the 83% achievement against the pre-set objectives in the questionnaire and an achievement of 79% against the company's set objectives tend to confirm this opinion.

Comments & Conclusions

The two initiatives described were undertaken over a similar time period, but with totally different perceptions of success within the organisation. The TPM initiative is continuing while Lean Manufacturing can be regarded as dead, due to the resignation from the programme of the Continuous Improvement Specialist who has been de-motivated through a lack of support. So what are the lessons that can be learned from these two initiatives, launched in the same organisation – Robert Bosch at Cardiff – but with very different results and outcomes?

The first observation is that the TPM initiative was set up with full support from the management team and with an appropriate level of resources, a full time co-ordinator and six full time facilitators. A similar level of commitment to resource was not given to the Lean Manufacturing initiative although a middle/senior manager was initially
appointed who was of a similar status to the TPM co-ordinator. The Lean Manufacturing initiative was regarded as a Corporate dictate and not a site management initiative whilst the TPM initiative was fully supported by the site Management Team. This resulted in a major difference between the management commitment towards the implementation of the two initiatives which is reflected in the additional comments. The comment from top management regarding the TPM initiative was that 'Top management support is critical, you will do it.' This was an important statement from top management and illustrates their drive and commitment. Two comments from the Lean Manufacturing project leader contrast sharply with this, ‘the initiative has to be sold to the management team at the outset' and ‘there needs to be education of the senior management team.’ This information supports much of the literature, which frequently suggests that top management support is essential to the success of an initiative.

Another area in which there was a distinct difference between the implementation of the two initiatives was the use and significance placed on performance measurement. The TPM initiative had benchmark measures and targets, which were (and remain) continually monitored and updated. The performance measures used on the Lean Manufacturing initiative were less clearly defined. Again two sets of comments, one from each of the initiatives illustrate this point, ‘continual feedback of measures and ongoing targets and feedback on achievement is essential' was a comment made by the TPM co-ordinator. In contrast, 'the outcomes and achievements need (measures) to be discussed with the management team.' was a comment made by the Lean Manufacturing Improvement Specialist when reflecting on the lack of progress made. Also the comment that 'more focused measures are required' is an indication of the lack of clarity related to the measurement of progress of the Lean Manufacturing initiative.

The Lean Manufacturing initiative was launched with five broad objectives which were not supported by clear, relevant, appropriate and updated performance measures. TPM, had two focused objectives, clearly linked and aligned to relevant performance measures and updated and monitored on a continual basis.
The TPM project was introduced in a structured way through the appointment of a full time co-ordinator and six full-time line facilitators and there was strong evidence of top down commitment and involvement. No such support or commitment was evident in respect of the Lean Manufacturing initiative, indeed the opposite was the case, that is one of lethargy or disinterest which resulted in the eventual resignation of the Improvement Specialist.

Research Case 2: Tenneco Walker UK Limited

Introduction to the Company

On November 5, 1999, Tenneco Automotive began its first day of trading as an independent division, within the Tenneco group, following completion of its separation from Tenneco's main packaging business. Tenneco Automotive is a $3.3 billion turnover global manufacturing business based in Lake Forest, Illinois, with 23,900 employees worldwide. The automotive division is one of the world's largest designers, manufacturers and distributors of shock absorbers and emissions control (exhausts) for the automotive original equipment market, and the repair and replacement, or aftermarket. On the emissions control side of the business, Tenneco Automotive sells its products under the Walker, and Gillet brand names. The company has more than 100 manufacturing, technical and regional facilities in 22 countries on six continents.

Tenneco Automotive has been successfully managing financial improvement initiatives for a number of years and has a strong record of cash generation. It also uses an integrated Business Operating System to manage its operations toward three strategic imperatives: customer satisfaction, employee satisfaction and Economic Value Added.

Tenneco Automotive's global mission is:

to delight our customers as the number one technology driven, global manufacturer and marketer of value differentiated ride control, emission control, and elastomer products and systems. We will strengthen our leadership position through a shared value culture of employee involvement, where an intense focus on continued improvement delivers shareholder value in everything we do.
Tenneco Walker UK Limited is a member of Tenneco Automotive and the Tredegar Division, which is the subject of this case study is one of Tenneco Walker’s UK plants. Tenneco Walker, Tredegar Division, employs 380 people and manufactures exhaust systems for some of the most popular models of motor vehicle. Customers of the Tredegar plant include General Motors for its Astra and Vectra models and Ford for the Transit and Jaguar X200. Turnover at Tredegar was around £55m for 1999 – 2000. The plant has a capacity to produce 500,000 exhausts annually, has its own mission statement and aims and objectives. These are:

MISSION STATEMENT
The philosophy of Tenneco Walker UK Limited, Tredegar Plant, is to achieve the best quality, at the most competitive price, combined with on time deliveries.

AIMS AND OBJECTIVES
- We aim to be the best in our field of business by putting QUALITY FIRST with a commitment to Customer Satisfaction.
- We will adhere to the requirements of ISO 9002 / QS 9000.
- We will form a partnership with both Suppliers and Customers, to achieve our stated objectives. We will always put customers' needs and requirements first, while maintaining our programme of Never Ending Improvement, which identifies goals, objectives and dates.
- We will ensure that an effective system for the control of quality is maintained utilising advanced quality planning and statistical control techniques. The system will provide for the control of supplies, for the prevention of shipment of non-conforming products to our customers.

'Quality is the business of every employee within the company.'

The majority of the customers at Tredegar are original equipment suppliers who demand high quality and cost effective products. Potentially over 2000 variants of exhaust can be manufactured at Tredegar. The company has a history of continuous improvement and introducing relevant improvement initiatives. The two cases studied at the plant are not
recent; Statistical Process Control (SPC) was introduced in 1989 and continued until 1993 when it began to falter; Kaizen was launched in 1992 and is continuing.

The Initiatives

1. Statistical Process Control

Statistical Process Control (SPC), when successfully introduced, can support quality improvement through process control using the skill and expertise of the process owners (usually the operators) and the use of control charts. The aim of SPC is to reduce variation in the process by using the charts to highlight assignable or special causes and then applying appropriate problem solving techniques to identify and then eliminate or reduce the cause of the problem.

The SPC initiative, at Tenneco was launched in 1989 and continued until 1993 when it was ‘killed’, according to the Human Resources Manager, through computerisation of the charts and the process. The initiative was introduced and driven by the management team. It was a top down driven initiative with a structured upward involvement. The initiative was managed and controlled by a full-time co-ordinator who also took responsibility for developing and delivering appropriate training. The initiative was implemented on the shop floor by providing specific SPC training to individuals backed up by a self-teaching open learning package. Process capability and the development of the control charts were carried out by the SPC co-ordinator. The operators and supervisors were trained to recognise specific trends and the operators were empowered to take the appropriate action. The main objectives behind the introduction of SPC were:

- Process improvement
- Reduce variability
- Improve consistency
- Satisfy Ford requirements
The above objectives, identified by the company, are obviously relevant to SPC although it is interesting to note that a cynic could regard the fourth objective, satisfy Ford requirements, as the main reason for its introduction. Associated with the objectives for the initiatives were the four performance measures shown in Table 24.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unit</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attain Ford Q1 status</td>
<td>N/A</td>
<td>Achieved 1990</td>
</tr>
<tr>
<td>Yield</td>
<td>%</td>
<td>No record</td>
</tr>
<tr>
<td>Scrap</td>
<td>%</td>
<td>20% reduction</td>
</tr>
<tr>
<td>Process capability</td>
<td>Cpk values</td>
<td>Improved from 1.3 to 1.6</td>
</tr>
</tbody>
</table>

The values quoted above are rather sketchy but nevertheless indicate significant improvements in scrap and process capability over the 4-year duration of the project. Also the achievement of Approved Supplier Status, that is Ford Q1 status, enabled the business to consolidate its supplier link with Ford and was regarded as an important milestone by the management team.

The main investment areas were committing to a full-time Tenneco facilitator, training the facilitator in the Ford process and programme (£2,000), setting up SPC charts and training over 250 people on site using a course provided by Ford.

**Meeting Goals**

Question 7, of the structured questionnaire, relates to the degree of success in achieving a number of pre set goals, see Table 19, and to add any further goals that were used. The organisation rated the achievement of the goals over the 4-year duration of the project at 82% and ranked their additional goal, the development of workforce skills and the expectations of training, at 75%. They also added the comment that the initiative was not sustained.
Other Changes

Tenneco indicated that there were a number of other changes, which resulted from this initiative. These included empowerment of people, a change in management style, a broader range of performance measures, a re-alignment of performance measures and a positive change in the way the organisation did business. However, one of the main failures, according to the company, was in the end an inability to change the deep-rooted culture or social fabric of the organisation.

What would be done differently?

Three main suggestions were made related to how the initiative would be introduced based on the current experiences. These were:

- Introduce assessment of operator capability at an earlier stage
- More feedback to the shopfloor operators regarding the progress of SPC at an earlier stage
- Define clear performance measures at an earlier stage

Further Comments

Two further points were raised:

- the company is considering re-launching SPC
- computerisation killed SPC, a paper based process was much more successful

The comment that computerisation killed SPC was related to the replacement of hand filled charts by computer based ones. When it was at its most effective, SPC was controlled and used, by the operators, by the use of paper control charts. The operators filled in the charts, manually, every time they took a sample reading and every time they took action. This helped to empower the operators to take appropriate action and they felt that they owned the charts and subsequently SPC within Tenneco.

When the process was computerised the paper-based charts were discarded. The operators then fed the information into a computer that automatically calculated the
average value and recorded it on a computer-based chart. This computer based chart removed the feeling of action and ownership and the operators became disenchanted. SPC eventually degenerated into a middle management reporting system that collapsed. When asked, the Company rated the initiative a success for the four-year period of its life.

ii. Kaizen/Continuous Improvement

Kaizen is an approach to continuous improvement based on teamwork throughout the organisation and the use of problem solving tools and techniques to identify and solve problems through small group activities. Kaizen focuses on many, small scale improvements through involvement from the whole workforce and management support and commitment to ideas and suggestions from the shop floor. Kaizen is often described as a philosophy or 'way of life' for an organisation and depends on an open, blame-free culture with a strong team ethic.

The kaizen initiative was launched, at Tenneco in 1992 and is ongoing according to the company. The three main areas, which were identified as the main drivers or objectives behind this particular initiative were described by the company as:

- Long term survival
- Loss of business
- Outcome of a benchmarking project

On the surface these appear to be dramatic reasons for introducing a long-term initiative such as kaizen, but they illustrate the degree of urgency that was felt at that time within the organisation generally, and at the Tredegar site in particular. The measures used to monitor the initiative are shown in Table 25:
Table 25: Measures of Performance – Tenneco

<table>
<thead>
<tr>
<th>Measure</th>
<th>At Launch</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of suggestions/ideas per annum</td>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>No. of suggestions implemented per annum</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>No. of people participating</td>
<td>6</td>
<td>200</td>
</tr>
<tr>
<td>Total value management</td>
<td></td>
<td>£1m plus savings</td>
</tr>
</tbody>
</table>

The information shown in Table 25 is based on results over an eight-year period, from 1992 to 2000. These results are not displayed within the organisation, although the Tredegar plant are proud of the fact that they are recognised as the most cost effective and efficient site within the Tenneco organisation.

In order to introduce and sustain the initiative a significant investment in time, money and people was required. Ten people were involved in a five-day benchmarking project, three people developed workshops over a one-month period, fifty employees were trained as facilitators over a one-week period, over two hundred and fifty employees were given awareness training on a two-day programme and a full-time continuous improvement co-ordinator was appointed. Also over £5,000 was invested in training in specific techniques.

Meeting goals

The company regarded the six goals suggested in the structured interview as being 100% achieved. This was in alignment with their overall drivers for the initiative, which were ‘long term business survival’ and ‘loss of business.’ The six goals that were fully achieved according to the company are to:

- Translate specific business objectives into concrete action
- Align people towards a common objective
- Produce measurable improvement/s – short term gains
- Produce measurable improvement/s – long term gains
- Drive improvements in business processes
- Enhance the organisation’s ability to compete in the future
Other changes

Question eight related to identifying and quantifying other changes that took place due to the initiative being introduced. Tenneco responded by indicating that three of the options suggested ranked four out of four whilst the other three were rated at three out of four. The company suggested that two additional changes had resulted from the initiative, enthusiasm and enlargement of the core, which scored four out of four and, company profile enhanced, which they rated at three out of four.

Process used to introduce the initiative

The initiative was firstly identified and agreed through a management team brainstorm and the use of consultants as a sounding board. The consultants undertook a benchmarking exercise and identified and helped to quantify the real and potential loss of business that could result should the initiative not take place. The process used to introduce the initiative was planned and developed by the management team. There was top down commitment and interest from the beginning. A full-time continuous improvement co-ordinator was appointed and trained. Workshops were developed to provide ownership to individuals and bottom up sustainability. A combination of top down commitment and bottom up activity with the management control of a full time facilitator was the improvement process used.

Problem solving teams were used to implement many of the suggestions made by the employees and to solve particular issues that arose on a daily basis. The teams were cross-functional for larger projects and consisted of all levels of employees, from managers to shop floor operatives. For smaller day to day issues informal problem solving was carried out within individual workstations and office environments. Tenneco suggested one improvement they would introduce if the initiative was being introduced in another organisation or a similar initiative was being introduced into Tenneco. This was to investigate, understand and introduce a reward and recognition process.
Further comments

The company discussed two further issues, one being that kaizen had acted as an umbrella initiative for other initiatives, as Imai shows in one of his most widely reproduced diagrams, (Figure 24). The second comment added by Tenneco was that they were currently introducing internal benchmarks in order to ensure continued sustainability. The company regarded the introduction of kaizen as a definite success.

![KAIZEN Umbrella](image)

- Customer orientation
- TQC (total quality control)
- Robotics
- QC circles
- Suggestion system
- Automation
- Discipline in the workplace
- TPM
  (Total Productive maintenance)
- Kamban
- Quality Improvement
- Just-in-time
- Zero defects
- Small-group activities
- Cooperative labour-management relations
- Productivity improvement
- New product development

Figure 24: The KAIZEN Umbrella: (Source: Imai, 1986:4, Figure 1.1).

Comments and Conclusions

The initiatives discussed, related to Tenneco, were introduced in 1989 (SPC) and 1992 (kaizen). Both initiatives were regarded by the company as successful. The kaizen initiative is very much still 'alive' within the organisation and is used as the umbrella or baseline initiative for lots of other improvements. Although SPC exists in very small pockets it is used as a data collection process not an improvement initiative. SPC was top management driven with a structured upward involvement and four key objectives were identified. In line with these four objectives, measures of performance were introduced and used which showed significant improvement over the four-year life of the
main project. These measures are still used in the organisation although they have moved to the use of parts per million (ppm) for defects and scrap in preference to percentage.

It was apparent that Kaizen was introduced with top management commitment. Three major objectives, or business pressures, confirmed that there was an overwhelming need for change. This fits with Kotter's first driver for successful change in that there needs to be a degree of urgency (Kotter, 1996). Evidence of commitment from top management was shown through the allocation of resources (people and financial), the amount of training provided and the appointment of a full time continuous improvement co-ordinator. The measures developed were relevant to the business and were recorded and analysed. Interestingly one of the measures - total value management - was an important senior management indicator and over the period of the project this measure indicated that there was over £1m saved through the kaizen initiative. Also the six goals set at the outset of the project were all fully achieved.

Paradoxically, Tenneco regarded the SPC initiative as successful, for the four-year period indicated, and achieved an 82% ranking in respect of the achievement of specific goals. They suggested that they could improve the introduction of similar initiatives by ensuring that clearly defined performance measures were introduced at the beginning of the project and by providing more feedback at an earlier stage. An interesting comment was made in relation to the SPC initiative in that it was believed that computerisation killed SPC. This was referring to the removal of hand filled charts to the generation of computer based information. This took visibility and eventually ownership away from the operators and SPC lost its effectiveness as a shop floor improvement mechanism and became a middle management reporting system which eventually collapsed.

Kaizen was regarded as successful and the company now use it as an umbrella for other initiatives. In order to sustain the continuous improvement focus, internal benchmarks are currently being introduced. The only suggestion that Tenneco made to improve the introduction of kaizen would be to introduce a reward and recognition process.
Research Case 3: Ortho Clinical Diagnostics

Ortho Clinical Diagnostics was used as one of the Case companies as it satisfied the selection criteria described earlier. An additional benefit was that the company presented an opportunity to broaden the research outside the automotive sector.

Introduction to the Company

Ortho Clinical Diagnostics (OCD) was registered in March 1995 and is the largest British in-vitro diagnostics company, employing approximately 484 people in the UK. The Company sells its products to clinical laboratories in hospitals and elsewhere. They conduct tests on patients' blood and other body fluids to help medical staff to diagnose illness and monitor therapy.

Ortho-Clinical Diagnostics is part of the Johnson and Johnson group. Johnson & Johnson was formed more than a century ago to introduce the benefits of the first antiseptic wound dressings. It claims to be the world's largest health care corporation. World wide sales were $29.1 billion for 2000 and $27.5 billion for 1999. OCD are the world's second largest supplier of medical devices and diagnostic products in their field. After Abbott Laboratories, OCD is the world’s second largest in-vitro diagnostic manufacturer.

Ortho-Clinical Diagnostics joined the Johnson & Johnson group when it was purchased from Eastman Kodak towards the end of 1994 for US $1.008 billion. OCD's heritage is founded on multi-layer dry slide clinical chemistry technology, developed from photographic colour film technology and introduced in 1983 by Kodak. This technology used Kodak's already proven advanced automation technology. Eastman Kodak was formed more than a century ago to introduce the world's first amateur camera. It became a health care provider 100 years ago with the introduction of the world's first radiography film.

British operations of Ortho-Clinical Diagnostics include a research and development facility at Pollards Wood, Bucks, which closed in July 2000. A factory for the production
of immunoassays for worldwide distribution is located in Cardiff, Wales and this factory is the subject of the two initiatives described later. Approximately 330 people are employed at Cardiff - and an essential challenge is seen as the transition from a laboratory based operation to a manufacturing plant.

The administration and sales headquarters are in Amersham, Bucks. This administrative headquarters is shared with two Johnson & Johnson diagnostic companies, Ortho Diagnostic Systems and Lifescan.

Strasbourg, France is the site of customer technical support and is location of the training centre for Europe, Africa and the Middle East. It was opened in 1994. Apart from providing training and technical support, Strasbourg is also the distribution centre for products sold in Europe, Africa and the Middle East. Most production from the Cardiff site is shipped directly to Strasbourg although the factory also directly ships to America and Japan via Heathrow in certain circumstances.

In recent years, Ortho Clinical Diagnostics has started to establish a high reputation for infectious disease assays used in the hospital laboratory. In partnership with its new sister company, Ortho Diagnostic Systems, it expects to further strengthen their presence in this area of diagnostics. Ortho-Clinical Diagnostics objective is to understand the needs of its customers and to exceed their expectations. Ortho believe that this will be to the benefit of their ultimate customer, the patient.

The Initiatives

i. Supermarket Pull System

This initiative was never formally launched but is interesting because it is an example of a potential improvement, which if implemented properly would have resulted in significant benefits for the organisation. The main reason for the initiative was to introduce a 'supermarket' of approved combinations of reagents in order to develop a disconnect between manufacturing to pre-approval and manufacturing to post-approval. The supermarket would be positioned at this disconnect point and would feed finished
goods stores and pull from manufacturing as and when required. At present the initiative is incomplete and has ceased progress, which is a reflection of the previous comments in that it was never formally or properly launched. The main objective, identified by the special projects co-ordinator at OCD, in respect of this initiative was to introduce the capability for the distributor to pull from the factory on a basis of all products every week.

![Diagram of Proposed Disconnect Process](image)

**Figure 25: Proposed Disconnect Process**

No measures were actually used to monitor the initiative. A number of measures were identified as being relevant but they were never actually introduced. These measures were linked to product stock levels:

- At the distributor
- Number of packed kits at the manufacturing site available for shipment
- Unpacked and approved combinations of reagents in units of final product requirements

However, none of the above measures was actually put into practice. One investment was to set up a brainstorming session involving staff from the USA (marketing and Supply Chain), the Strasbourg office and manufacturing personnel.
Meeting Goals

Question 7, which relates to the degree in which the initiative satisfied a number of key goals reflected the lack of success and commitment towards the introduction of the initiative. Five out of six of the pre-set goals listed on the questionnaire were rated as a 1 (no success) the other was rated as a 2 (some success). No additional goals were identified or rated by the company.

Other Changes

Only one change resulted from this initiative according to the company and this rated only a 2 (some change). The change identified was that ‘managers moved to a coaching/facilitation style.’

Process used to introduce the initiative

The initiative was based on an attempt by the Cardiff manufacturing management team to change the way business was conducted globally in an attempt to reduce the need for large batch processing. However, outside the Cardiff site there was little support from the procurement and purchasing group who were the main customers of the current process. Also Corporate showed little interest and support, as they did not expect the project to succeed and became reluctant to influence any changes that were required. This resulted in a situation where there were no clear drivers and strategy for success.

What would be done differently?

The initiative failed to take root because it was being driven from the wrong place, that is manufacturing. In reality manufacturing was only a minor stakeholder and could not be the main initiator and driver. It was concluded that for the initiative to succeed it had to be driven by the appropriate people in purchasing and procurement and through the Head of the Supply Chain.
Further comments

The company provided a number of further comments. It was felt that manufacturing had attempted to introduce something that was ahead of its time, but which would have considerably improved the whole supply chain. The initiative would also have given the impression that the factory was able to manufacture every product each week. Unfortunately the supply chain managers were not sufficiently motivated to commit to the project. They were not the project initiators and did not trust manufacturing to be able to supply weekly, they preferred to retain the bi-monthly supply that they were comfortable with. They did not have the knowledge or education to understand the Lean principles being introduced. When attending a workshop of USA/Strasbourg/UK personnel the interviewee commented that it was obvious that 'the shutters were up from the start' as there was very little support or enthusiasm generated towards the initiative, other than from the Cardiff manufacturing people. Not surprisingly, when asked if the company rated the initiative a success, the answer was a resounding negative.

ii. Cellular Manufacturing

Cellular manufacturing is a derivative of group technology. Group technology is the organising and bringing together of common concepts, principles, problems and tasks into 'cells' to improve productivity. A cell is a mini-production line where the machines and equipment are placed close together, often in a 'U' shape, and families of similar parts are produced. In a cell the machines, the people and the work flow are all organised the same way and tight, controlled operation is attained. The cell leader and cell members are empowered to control product quality, cost, lead time and flexibility within the cell and to take action when things go wrong.

The cellular manufacturing initiative was introduced, at Ortho Clinical Diagnostics, over a short concentrated one-week period during February 1999. The initiative was the result of a Senior Management decision, at the Cardiff site, to attempt to radically improve the production process in line with future increases in productivity and quality. It consisted of changing final product assembly from a flow line based batch process to a single piece
flow cellular arrangement. The introduction and implementation of the initiative was completed over one working week but a further two-month period was required for slight modifications and bedding in. The cell is still ongoing. Clear well-defined objectives were set for this initiative by the management team. These were to:

- Change the existing flow line to a working cell arrangement
- Move from batch to single piece flow
- Reduce work-in-progress
- Reduce cycle time per piece
- Reduce the space required to manufacture the product

When clear objectives are defined, it is more likely that performance measures are also identified and used. This was the case with this initiative and performance measures with up to date figures were available. These measures, consisting of the current and benchmark measures, are shown in Tables 26 and 27.

**Table 26: Measures for Product 1: RIA Assembly**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Benchmark</th>
<th>Current</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in Progress</td>
<td>26</td>
<td>5.8</td>
<td>Down 77.5%</td>
</tr>
<tr>
<td>Cycle time</td>
<td>285 secs.</td>
<td>104 secs</td>
<td>Down 63.5%</td>
</tr>
<tr>
<td>Space</td>
<td>50 m²</td>
<td>29.2 m²</td>
<td>Down 41.6%</td>
</tr>
<tr>
<td>Work content</td>
<td>53 secs.</td>
<td>48.8 secs</td>
<td>Down 7.9%</td>
</tr>
<tr>
<td>People Required</td>
<td>6</td>
<td>3</td>
<td>Down 50%</td>
</tr>
</tbody>
</table>

**Table 27: Measures for Product 2: Eci Vitros Reagant Pack Assembly**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Benchmark</th>
<th>Current</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in Progress</td>
<td>99.9</td>
<td>16.2</td>
<td>Down 83.8%</td>
</tr>
<tr>
<td>Cycle time</td>
<td>600 secs.</td>
<td>125.8 secs</td>
<td>Down 79%</td>
</tr>
<tr>
<td>Space</td>
<td>81.6 m²</td>
<td>47 m²</td>
<td>Down 42.4%</td>
</tr>
<tr>
<td>Work content</td>
<td>49 secs.</td>
<td>34.6 secs</td>
<td>Down 29.49%</td>
</tr>
<tr>
<td>People Required</td>
<td>9</td>
<td>6</td>
<td>Down 33%</td>
</tr>
</tbody>
</table>
Interestingly this was a short, sharp kaizen blitz\textsuperscript{1} initiative, which required a focussed one-week involvement followed by a two-month settling in period. To support the kaizen blitz activity a modest investment was required and provided. This investment consisted of the services of a specialist from America for one week and a project management team from the kit assembly area consisting of one manager, one team leader and one supervisor. Also an additional technical person was provided. The activity required the full involvement of the operators and consisted of re-laying out the area into a cellular manufacturing approach where the flow of work was focused into a smaller, controlled area. The operators were involved in suggesting how the equipment should be layed out and in the actual movement and re-arrangement of the cell. Following the one-week exercise new benches and signs were purchased to improve the appearance of the area.

Meeting Goals

Question 7 relates to the degree in which the initiative satisfied a number of pre-set goals. Six goals were proposed by the questionnaire and the company indicated that four of these were very successfully achieved. One goal that was achieved was the translation of specific business objectives into concrete action - a practical change and real success. Other changes that resulted from the initiative included the introduction of a broader range of performance measures, which was rated as a significant change. Cultural changes, people empowerment, a coaching/facilitation style of management and the initiative changing the way we do business were rated as quite noticeable changes.

Process used to introduce the initiative

The impetus for the initiative came from the top management team, who also ensured that adequate resources were available. Responsibility for implementation was delegated to the project team, who in turn empowered the operators to own the initiative by encouraging them to support and work with the new process. Senior management

\textsuperscript{1} Kaizen Blitz: Alternative name for kaikaku, which uses a team of people to achieve results in a short period of time
kept an active interest in the success of the initiative by subsequently walking the area and helping to identify further changes and improvement opportunities.

Comments

In the interviewee's opinion the main reason for the success of the initiative was the fact that only a single functional unit was involved. Also, the manager of the functional unit was fully committed to the initiative and able to influence and gain assistance from other areas when required due to the seniority of his position and the support of the senior management team. The success of the initiative removed the requirement to bring in additional temporary labour to meet increased demand in output within the area and the company, as expected, rated the implementation of this initiative as a complete success.

Comments and Conclusions

The two OCD initiatives described above were very different, one being a short, sharp, shock, whilst the other was intended as a longer term, cross-functional, team based improvement. There was a significantly different outcome from each of the initiatives – the supermarket pull system was regarded as a complete failure whilst the introduction of cellular manufacturing was regarded as a complete success.

The cellular manufacturing initiative was introduced over a relatively short time period, with top down commitment, appropriate resources and bottom up involvement and was introduced into one functional unit. Clear, well-defined objectives were established early in the project planning stage and these were aligned with relevant performance measures. The company rating was 92% in respect of achieving its goals and 75% in respect of other changes introduced. Five clear objectives and six clear measures were established and used.

In contrast the supermarket pull initiative rated 29% against achievement of goals and 29% against other changes introduced. One high level, woolly objective was introduced and there were no clear performance measures established for the initiative. There was
no clear owner of the initiative, manufacturing attempted to drive it upwards which proved impossible and as a result the initiative failed.

Thus, two initiatives were introduced into the same organisation with completely different outcomes. Although the initiatives were different and had a contrasting breadth and focus, findings can be formulated linked to the level of commitment, objectives and performance measures. Tables 28, 29, 30 and 31 provide a summary of the main outcomes from each of the initiatives investigated.

Table 28: Summary of Responses to Question 7 and Question 8

<table>
<thead>
<tr>
<th>Initiative</th>
<th>% Achievement of goals (Q7)</th>
<th>% success in respect of other changes introduced (Q8)</th>
<th>Success?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosch Lean Techniques</td>
<td>100% on pilot, 58% for business</td>
<td>59%</td>
<td>Pilot yes, Business not yet</td>
</tr>
<tr>
<td>Bosch TPM</td>
<td>83%</td>
<td>90%</td>
<td>Yes</td>
</tr>
<tr>
<td>Tenneco SPC</td>
<td>82%</td>
<td>89%</td>
<td>Yes, but not sustained</td>
</tr>
<tr>
<td>Tenneco Kaizen</td>
<td>100%</td>
<td>88%</td>
<td>Yes</td>
</tr>
<tr>
<td>OCD 'Supermarket' pull</td>
<td>29%</td>
<td>29%</td>
<td>No</td>
</tr>
<tr>
<td>OCD Cellular</td>
<td>92%</td>
<td>75%</td>
<td>Yes</td>
</tr>
<tr>
<td>Initiative</td>
<td>Number of main Objectives identified with the Initiative</td>
<td>Measures used to monitor the Initiative</td>
<td>Investment</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Bosch Lean Techniques</td>
<td>5, broad objectives</td>
<td>7 measures, 4 with feedback but no clear results</td>
<td>Investment in racking – awareness training for 150 people</td>
</tr>
<tr>
<td>Bosch TPM</td>
<td>2, focused and linked to initiative</td>
<td>6 measures, each monitored and with results.</td>
<td>High investment in developing people and awareness sessions, investment in equipment when required.</td>
</tr>
<tr>
<td>Tenneco SPC</td>
<td>4, broad objectives</td>
<td>4 measures – results stated</td>
<td>Training of 250 people</td>
</tr>
<tr>
<td>Tenneco Kaizen</td>
<td>3, survival based</td>
<td>4 measures – clear results</td>
<td>High investment in developing people (250 plus)</td>
</tr>
<tr>
<td>OCD ‘Supermarket’ pull</td>
<td>1, high level ‘woolly’ objective</td>
<td>Not established</td>
<td>No dedicated team.</td>
</tr>
<tr>
<td>OCD Cellular</td>
<td>5, linked directly to initiative</td>
<td>Six clear measures established and used</td>
<td>Expertise supplied, team established, purchases made when required</td>
</tr>
</tbody>
</table>

161
### Table 30: Summary of Responses, Initiative Introduction, Re-launch and Success

<table>
<thead>
<tr>
<th>Initiative</th>
<th>How the initiative was introduced?</th>
<th>What would be done differently if the initiative was re-launched?</th>
<th>Did the company feel that the initiative was successful?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bosch Lean Techniques</strong></td>
<td>Appointment of full-time project manager. Pilot to prove. Low commitment from senior plant management</td>
<td>Education of management team. Discuss outcomes and objectives with the team. ‘Sell’ to management team at outset.</td>
<td>Pilot was successful but the initiative has had low impact on the business.</td>
</tr>
<tr>
<td><strong>Bosch TPM</strong></td>
<td>Top down commitment and involvement. Bottom up activity. Role of C.I. department in supporting TPM co-ordinators was critical.</td>
<td>Establish budget up front. Train team of co-ordinators in depth. Nominate team leaders to be TPM champions, train them and look after them.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Tenneco SPC</strong></td>
<td>Top down, driven by the management team</td>
<td>Define clear performance measures earlier, introduce assessment earlier and more feedback.</td>
<td>Yes, for duration of perceived need for the initiative. Initiative was not sustained. Being re-launched.</td>
</tr>
<tr>
<td><strong>Tenneco Kaizen</strong></td>
<td>Consultants used as a sounding board. Structured approach using top down commitment. Workshops for employees, C.I. co-ordinator established</td>
<td>Look at reward system and recognition process</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>OCD ‘Supermarket’ pull</strong></td>
<td>No clearly developed or planned process</td>
<td>Needs to be driven by the CEO or head of the supply chain.</td>
<td>No</td>
</tr>
<tr>
<td><strong>OCD Cellular</strong></td>
<td>Top down driven to set up the initiative. Team established to implement the initiative. Top management ‘walked’ the area to check and review results. Effective change agent established.</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 31: Summary of Responses: Further Comments

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Further Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosch Lean</td>
<td>Need to move from function to process driven. Need to sharpen up act and become more customer focused. More focused measures required.</td>
</tr>
<tr>
<td>Techniques</td>
<td></td>
</tr>
<tr>
<td>Bosch TPM</td>
<td>Part time steering committee of senior managers which meet monthly is being re-instigated. Cross functional meeting of 'rest' of management meet on a 3 monthly basis. Start small and build. Re-establish control by setting up steering group. Continual feedback of measures with ongoing targets and achievement is critical.</td>
</tr>
<tr>
<td>Tenneco SPC</td>
<td>SPC being re-launched. Computerisation of the recording of results and plotting the graphs killed SPC – Paper based process much more successful.</td>
</tr>
<tr>
<td>Tenneco Kaizen</td>
<td>Umbrella initiative for other activities. Internal benchmarks for sustainability being established</td>
</tr>
<tr>
<td>OCD ‘Supermarket’</td>
<td>Initiator of the improvement was at the wrong point i.e. manufacturing rather than the supply chain. Difficult to gain commitment.</td>
</tr>
<tr>
<td>pull</td>
<td></td>
</tr>
<tr>
<td>OCD Cellular</td>
<td>One of the key drivers of the initiative was the manager of the area and this helped to ensure support.</td>
</tr>
</tbody>
</table>

5.4 Critical Evaluation

Six case studies were developed based on information from three different organisations. Three were regarded, by the companies as completely successful and sustained, one was regarded as successful but not sustained, the remaining were regarded as unsuccessful, one a complete failure and one successful as an approach within a specific defined area but with little impact or success within the overall business. Not surprisingly, no initiative was unsuccessful and sustained and the likelihood of this occurring, based on the research undertaken appears to be quite low. Figure 26 illustrates successful against sustained initiatives in grid form for clarity.
The main purpose of developing the case studies was to provide information to analyse Research Questions 2 and 3 and secondly to gather material to help develop the sustainable improvement model. This section will review each of the research questions against the information from the six case studies, described earlier. Research Question 2 splits into four sub-questions and each sub section will be considered in turn. Research Questions 2a and 2b are concerned with the reasons why the improvement initiatives failed or succeeded. This information will contribute to understanding why initiatives fail or succeed. Research Questions 2c and 2d question whether there are common factors or circumstances which if in place at the commencement of an improvement initiative will make it more likely to be successful (2c) and sustained (2d).

The grid, Figure 26, was used to identify which of the case studies had information appropriate to the areas indicated by the four sections of Research Question 2.
Research Question 2a was concerned with understanding the reasons for the success of improvement initiatives. Figure 26, indicated that the four successful initiatives were:

- Tenneco - kaizen
- Ortho Clinical Diagnostics - Cellular Manufacturing
- Robert Bosch TPM
- Tenneco - SPC

These four case studies were analysed and the main reasons that contributed to their success, are described below.

Tenneco, Kaizen

As described in detail in the case study the Tenneco, kaizen initiative was launched in 1992 and followed a management review of the business supported by consultants. The main focus behind the initiative was dramatic in that the survival of the site was at stake.

The reasons for the success of this initiative have been identified through reviewing the case study. Because of the survival situation there was a high degree of urgency amongst the management team, initially, and throughout the site, eventually, as the initiative moved forward. A significant investment in training and the use of cross-functional problem solving teams helped to generate enthusiasm and commitment in a core group of employees. Bottom up activity was encouraged and activated. The use of appropriate performance measures helped the management team to maintain control and monitor progress of the initiative, changing direction in line with the outcomes of the measures if necessary.

Ortho Clinical Diagnostics - Cellular Manufacturing

In contrast to the Tenneco kaizen initiative this was a short, sharp shock launched to change a process and create sustainable change. The short, sharp, shock (or kaizen blitz) approach was recognised as a significant reason for the success of the change. Employees could see things happening and became involved in improvements over a
relatively short period (1-week) and this helped to maintain commitment and enthusiasm. The unit manager was fully committed to the change and ensured that sufficient resources were available. Another reason for success was the focus of the management team on a single functional unit which enabled a concentrated approach with no dilution of effort.

Robert Bosch TPM
The Robert Bosch TPM initiative was successful for a number of reasons. The investment in resources and training was validated by the appointment of a full time co-ordinator and six full time line facilitators. This demonstrated management commitment and provided a support structure for the initiative. Further support was also provided by the continuous improvement team to assist the facilitators in the delivery of the workshops.

Another reason for the success of the initiative was the use of performance measures with continual feedback against the measures and achievement of success. Finally the implementation plan started small and built on success and this proved to be a successful recipe for success of the TPM initiative.

Tenneco SPC
This initiative was successful for a number of reasons. Firstly, it was introduced and driven by the management team which demonstrated their commitment. The initiative had four clearly defined objectives together with clear performance measures. This provided a clear way forward and a means of maintaining direction. Finally, the initiative was taken to operator level by empowering the operators to act when the charts indicated that action was required. This gave the initiative credibility and support and ensured that there was ownership where it mattered – with the users of SPC, the shopfloor operators.

From the above discussion a number of common reasons for the success of an initiative were identified.
• Performance measures were identified and used to monitor and control progress of the initiative
• Resources were made available including training and support structures
• Management commitment was demonstrated by providing resources and a structure to drive the initiative forward
• Shop floor employees were involved and empowered to act if the need arose
• The approach was planned by the management team and appeared to be 'fit for purpose'.

It is also important to emphasise that a further reason for the success of the initiatives, described above, is that they were launched with all the factors for success (see Research Question 2c) in place.

Research question 2b was concerned with the reasons for failure of improvement initiatives. These reasons were analysed from two relatively unsuccessful initiatives, again indicated by Figure 26.

• Robert Bosch – Lean Manufacturing
• Ortho Clinical Diagnostics – Supermarket Pull system

Robert Bosch – Lean Manufacturing

It can be debated whether the Lean manufacturing initiative was unsuccessful as the pilot achieved most of the objectives that were set for it. However, to regard the initiative as successful would be missing the point as the pilot was introduced as the first step in the development of major change throughout the plant.

Unfortunately, Lean Manufacturing was not committed to by the site management team. It was a Corporate directive rather than a site objective and the appointment of the project co-ordinator appeared to be a token gesture to show compliance with this Corporate dictate. The project co-ordinator appointed was of a relatively low status and this resulted in the initiative having insufficient influence at Senior Management level at the site. There was no development of performance measures to monitor progress of the initiative and performance measurement was, subsequently, regarded as patchy.
A demonstration of the lack of commitment of the management team was portrayed through the failure to provide a structure or team to support the project co-ordinator. Finally, the lack of interest in, and the reluctance to review the pilot initiative by the management team provided further confirmation of their lack of interest in the initiative and was another reason for the eventual failure of this initiative.

Ortho Clinical Diagnostics – Supermarket Pull system

This initiative was a complete disaster and there are a number of reasons why. Firstly, the initiative was not formally launched and no structure or plan was developed to support its introduction. No clear drivers, objectives or plan for implementation was developed.

The supermarket pull system was informally introduced with no obvious measures of performance and so it was difficult to monitor and maintain progress. The management team were not committed to the initiative as they failed to understand the potential benefits that could result. Finally, the initiative had little or no support from important stakeholders, the CEO and the Head of the Supply Chain.

From the above information a number of common reasons for failure can be identified:

- Lack of suitable performance measures and monitoring
- No plan, structure or strategy to take the initiative forward
- No commitment from top management
- The lack of commitment was demonstrated by the failure of management to support the project co-ordinator (Lean) and the manufacturing site (OCD)
- The project manager or change agent was of low status in the organisation
- The benefits were not sold to the management team
- There was a lack of understanding of the potential benefits and of the initiative itself from the management team
Again, it must be pointed out that a further reason for the failure of the initiatives, described above, is that they were launched with few if any of the factors for success (see Research Question 2c) in place.

Research Question 2c asked what factors need to be established or present when an improvement initiative is launched that will make it more likely to be a success. The common factors for success were identified through review and analysis of the four successful initiatives:

- Tenneco – SPC
- Tenneco – kaizen
- Robert Bosch TPM
- Ortho Clinical Diagnostics – Cellular Manufacturing

These four initiatives were individually analysed and the factors that were in place and contributed to success for each of the initiatives were:

**Tenneco, Kaizen**
- Use of consultants as a sounding board at the start of the initiative
- Planned approach, developed and committed to by the management team
- Top down commitment and involvement

**Ortho Clinical Diagnostics – Cellular Manufacturing**
- Support and involvement of the management team
- Top management driven
- Clear, well defined objectives
- Performance measures aligned with the objectives and used. A set of benchmark measures were taken and recorded at the beginning of the project
Robert Bosch TPM
- Management structure in place to support the initiative
- Performance measures developed and used including benchmark measures
- Management commitment and involvement
- Clear, specific company goals
- Structured approach, top management commitment and support

Tenneco SPC
- Four clearly defined objectives
- Four clear performance measures
- Introduced and driven by the management team

From the above a number of common factors which helped to improve the chances of success were identified:

- Planned, structured approach introduced and driven by the management team
- Management commitment and involvement
- Clear, well defined objectives
- Performance measures developed and aligned with the objectives and used. A set of benchmark measures were taken and recorded at the beginning of the project
- Management structure in place to support the initiative
- Clear, specific company goals

Research Question 2d asked what factors need to be established or present when an improvement initiative is launched that will make it more likely to be sustained. The common factors for sustainability were based on an analysis of:

Tenneco – Kaizen
Robert Bosch – TPM
Ortho Clinical Diagnostics – Cellular Manufacturing
These three initiatives were individually analysed and the factors that were in place and contributed to sustainability for each of the initiatives were identified as.

**Robert Bosch – TPM**
- The infrastructure was established, one full-time co-ordinator and five full time facilitators were appointed
- The measures used for TPM were related to real business improvement
- Two management committees were established to ensure a reporting structure and steering group existed

**Tenneco – Kaizen**
- Long term business survival was one of the goals
- A planned approach was used by the management team assisted by consultants

**Ortho Clinical Diagnostics – Cellular Manufacturing**
- An objective was to translate specific goals into concrete action
- Support and commitment from the management team

Although these factors were determined as necessary for sustainability it was also worth noting that no initiative was unsuccessful and sustained. This suggests that in order for an initiative to be sustained it also needs to be successful. All the factors for success, therefore, also need to be in place as well as the factors for sustainability in order to increase the likelihood of an initiative being sustained. It is also worth discussing the reasons that contributed towards the sustainability of improvement initiatives. These were identified by analysing the three case studies in which the initiatives were recognised as being sustained:

**Robert Bosch – TPM**
**Tenneco – Kaizen**
**Ortho Clinical Diagnostics – Cellular manufacturing**
Robert Bosch – TPM

- Performance measures were identified and used on an ongoing basis
- An investment in training was made as and when required
- There was evidence of a cultural change towards a more innovative, improvement based culture
- The initiative changed ‘the way we do business’
- Ownership of the equipment was given to the operators
- Maintenance tasks were taken on board by the operators
- Continual feedback of progress through performance measures

Tenneco – Kaizen

- There was a significant financial investment and an investment in time and people
- Over 250 employees were trained on the 2 day awareness session
- Fifty employees were trained as facilitators
- Enthusiasm was created and sustained in a core group of employees
- Ownership at all levels was encouraged through workshops
- Cross functional problem solving teams were developed and used
- Internal benchmarks were used to ensure ongoing sustainability

Ortho Clinical Diagnostics – Cellular Manufacturing

- Ongoing performance measures were developed and used
- There was investment in the area in new benches and signs
- People were empowered
- A coaching, facilitation style of management was used
- The initiative changed the way business was done, it became difficult to go back
- The manager of the department was fully committed to the change

Finally, a question worth considering is why the Tenneco, SPC initiative was successful but not sustained. It appears that many of the ingredients for success and sustainability were in place at the start and in the early stages of the project. However, management changed the way SPC was used by deciding to computerise data collection and chart
production. This reduced visibility, to the operators, of how the process was performing and ultimately removed their power to stop the process. They eventually lost interest in the process and stopped carrying out their statistical samples. This lead to the demise of the initiative. The lesson to be learnt is that a change of focus or process ‘improvement’ must be clearly communicated to and agreed with the process owners – in this example the shop floor operators.

Research Question 2 has been thoroughly discussed and the factors and reasons for the success and sustainability of an improvement initiative have been identified. These are summarised below:

Top management commitment and involvement are essential for success. The successful initiatives had top management direction and a full time representative or actual top management presence to drive the process forward. Management commitment must be demonstrated by providing sufficient resource – training and investment where necessary.

Measurable business improvement objectives must be defined and agreed up front. These have to be developed, agreed and bought into by the management team, the change champions and eventually the entire workforce.

Performance measures that align with the business objectives defined earlier must be utilised and developed. These measures must be driven by the management team and reported and acted upon regularly. The measures need to be operational, action based for the shop floor and possibly more strategic for top management.

A change champion or facilitator needs to be appointed at the beginning of the change process. This person must be either a member of the senior management team or directly responsible to the senior management team. Training and development must be identified and undertaken at an early stage for the change champion(s) or facilitator(s).
Bottom up involvement requires awareness training (at least) and possibly more in depth training to ensure and encourage progress. Bottom up involvement works best when people are in control of their own process, actions and improvements. The SPC example at Tenneco illustrated this concept very clearly. However, the approach must be planned by the management team and be 'fit for purpose'.

The second question investigated was Research Question 3. This question asks whether the initiative being introduced was part of an overall strategy and secondly whether the introduction of the initiative itself was planned. The earlier investigation of Research Question 2 concluded that one of the reasons for the success of the four successful case studies was that:

- the approach used was planned by the management team and was 'fit for purpose'.

This suggests that for successful initiatives there is a definite need to plan and that the management team is carrying out a degree of planning. It would be tempting to conclude, from this information, that management are taking a planned approach to the introduction and sustainability of improvement initiatives. It is more accurate to conclude that management are taking a planned approach to the introduction of successful initiatives.

Research Question 3 also asked whether management were introducing improvement initiatives as part of an overall business strategy. Again, it could be argued that there was evidence of a long term, strategic approach taken especially with the Tenneco, kaizen initiative and also to a lesser degree the Bosch TPM initiative. However, it must be emphasised that the case study work was based on successful and unsuccessful initiatives, one of each in each of the case companies. There was no research done, in the case studies, regarding how many initiatives had been attempted over the past few years in each of the case companies and whether the initiatives being introduced were part of a wider strategy. It is more appropriate, at this stage, to refer to Chapter 4 where it was determined that an average of 13 initiatives had been attempted in 39
surveyed companies. This tends to support the view that initiatives are not usually introduced as part of an overall strategy.

It can also be concluded that there was little evidence of the management team considering how the change initiative could be best implemented and integrated in their company with its unique culture, and management style. It was usually a case of the initiative driving the change process based on the proven path, or recommended implementation process, rather than the change process driving the initiative based on the company's uniqueness. What was not considered was:

- How the initiative or implementation process could be sustained. Should there be a mechanism to review and change the process of implementation in line with company needs, evolution and sustainability? Is there such a process evaluation process... normally no.

- The receptiveness of the organisation to change, the culture of the organisation and whether a change of culture was required.

- The urgency of the change. Whether the change was reactive or proactive although there was certainly an understanding of the need for survival with the Tenneco, kaizen initiative.

The case study work reinforced the need for a process or model that would make the management team consider a broad range of factors and help them to develop and commit to a unique implementation plan for their organisation that would increase the likelihood of success and sustainability of their performance improvement programme. The development of each of the case companies was based upon the structured interviews using the questionnaire. A secondary objective of the research was to collect more relevant and detailed information in specific areas that would contribute to the development of the final model.
Analysis of the case studies identified a number of factors and reasons that would contribute to the failure, success and sustainability of an improvement initiative. It was also evident from the case studies, especially when relating to the successful initiatives that planning and detailed analysis up front are essential pre-requisites to success. It was difficult to determine from the case companies whether improvement initiatives were being introduced as part of an overall strategy for improvement. However, it was concluded that this was unlikely when the evidence from the survey of automotive companies, described in Chapter 4, was considered.

Taking into consideration the outcomes of the case-study work, the literature review and the survey of automotive companies, it was concluded that the development of a generic model that will improve the likelihood of success and sustainability of improvement initiatives into an organisation was viable and necessary. The development of the model, which is the overall aim of this research, is described in the next chapter.
Chapter 6
CHAPTER 6 - PHASE 3: THE MODEL

6.1 Introduction

This chapter deals with the development and testing of a model that consists of two tools that provide senior management teams in manufacturing companies with complementary methods for:

- Evaluating the likelihood of success, the Initiative Measurement Tool (IMP)
- Developing a change process to support a proposed performance improvement

This chapter first describes how a sustainable improvement model was developed, then how it was tested and finally draws conclusions and recommendations regarding its effectiveness and use. The model takes account of the research undertaken in the case studies and the literature reviewed and described in Chapters 1 and 2. The full model with management guide sheets and charts is shown in Appendix 7. This model attempts to cover all aspects of a performance improvement initiative by assisting with the introduction and ongoing management of the change process and represents phase 3 of the primary research that was identified in Chapter 2.

Although the model may appear, at first sight, to be complex, applying it will encourage discussion and agreement by the management team on the most appropriate way forward for the organisation. The model is designed to support a successful initial implementation of an improvement and its ongoing sustainability as the culture and receptiveness (or resistance) to change alters. The Initiative Measurement Process (IMP) has been developed as the final stage of the model application to provide a reality check on the outcome of the change process developed by the management team. The IMP will highlight possible areas for review and further discussion that will increase the likelihood of success of the performance improvement process developed by the management team. Using the model and applying the (IMP) on an ongoing basis will create feedback and encourage regular, planned discussion on progress by the management team and/or the change agents. It is intended that the model becomes
part of the strategic planning process and acts as a catalyst to support the implementation of change within the organisation. The model is unique and is intended to be used as a management tool to be applied at the start of a change process and as an ongoing reality check on progress. Applying the model can help to successfully introduce and sustain performance improvement. Figure 27 provides an overview of the model application process.

6.2 Developing the Model

The model was developed from information provided by the literature review and the primary research undertaken during Phases 1 and 2. The foundation of the model was a distillation of the advice of the various authorities researched as part of the literature review. These provided the following points of emphasis:
- It is essential to clearly understand the existing culture and the implications of proposed changes before embarking on the process of change. The existing culture will influence the approach to change and the speed with which the change can be effected. Significantly, the consensus of opinion amongst academics is moving towards believing that culture can be managed and changed.

- Burnes (2004: 328) suggests a menu approach to change whereby organisations or more accurately those who manage them, can choose the approach which fits their circumstances. This approach is in line with Dunphy and Stace (1993:905) who discuss the need for a situational or contingent model that will help to determine how to vary strategies to achieve 'optimum fit' with the changing environment.

- Top management has to take responsibility for the final crafting of the strategy and ensuring that it is driven or deployed through the organisation.

- Strategies, policies, structures and processes need to be aligned and pulling in the same direction and be congruent with the company's vision.

- Empowerment and a bottom up approach is not the solution to all organisational problems, what is really required is an approach to improvement that fits the organisation.

- To sustain an improvement programme the need for monitoring and adjusting the tactics accordingly is paramount. This requires performance measures that link the mission, strategy, goals and processes of the organisation.

- Strebel (1994) suggests a number of factors that need to be considered when developing a change programme and progress should be re-evaluated as the change initiative advances resulting in a preferred approach to change at a particular point in time.

This information was then modified by the results from Phases 1 and 2 of the primary research which suggested that:

- Measurable business improvement objectives must be defined and agreed up front by the management team. When clear (as opposed to 'woolly') objectives are defined and introduced, it is more likely that performance measures will be identified and used.

- Top management commitment and involvement are essential for success. Successful initiatives require a planned, structured approach introduced and driven by the management team. Management commitment must be demonstrated by providing resources and a support infrastructure to drive the initiative forward.

- The results of the survey showed that an average of 13 initiatives had been attempted in each of the 39 surveyed companies. This tends to support the view that initiatives are not usually introduced as part of an overall strategy. However, the case studies indicated that management were taking a planned approach to the introduction of successful initiatives.

- There was little evidence of the management team considering how a change initiative could be best implemented and sustained in their company with its unique culture and management style and whether a change of culture was required. Little if any evaluation of culture took place.
- No evaluation took place of how the initiative or implementation process could be sustained. There was no mechanism to review and change the process of implementation in line with company needs, evolution and sustainability.

- There was no evidence of a process in place to select the appropriate improvement initiative/s to support a specific performance improvement within the organisation. It was more a case of introduce and fit this particular initiative to the organisation.

The model is a strategic diagnostic tool, which facilitates successful change within an organisation. This section describes the development of the model and also the Initiative Measurement Process (IMP) which was developed to attempt to determine the likelihood of success of a performance improvement programme following the application of the model. Thus, the outcome of a full, initial application of the model will be an implementation plan with an assessment rating of potential success which has been fully discussed and committed to by the management team.

The process flow of the model is shown in Figure 28. The model consists of 5 distinct stages with specific outcomes at each stage that must be developed and agreed by the management team – Table 32. The outcomes of each of the activities are recorded in the model worksheets - Appendix 7 which follow the logical flow of Figure 28 and provides further information related to each of the stages. A detailed description of the model follows.

Table 32: Overview of Model Stages and Outcomes

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initiation and agreement</td>
<td>Statement of 'whys' (Box 'B')</td>
</tr>
<tr>
<td>2</td>
<td>Define the objectives</td>
<td>Agree a list of 'whats'</td>
</tr>
<tr>
<td>3</td>
<td>Identify and agree the means</td>
<td>Agree on technical factors and activities defined to effect change</td>
</tr>
<tr>
<td>4</td>
<td>Check success potential</td>
<td>Agree IMP score and whether to move forward or revise</td>
</tr>
<tr>
<td>5</td>
<td>Implementation</td>
<td>Detailed implementation plan agreed</td>
</tr>
</tbody>
</table>
Need to do 'Something'

Awakening

Identify the 'whats'
- cost reduction
- flexibility
- Speed
- Reduce waste
- e commerce
List of key objectives

Path 1

Identify the 'hows'
What tools and techniques will help us to achieve the 'whats'?
(See Table 41 – Appendix 7)

Path 2

Proactive or Reactive?

Strong or weak forces?

Nature of Change defined

Figure 28: Flow Chart of Model
Proactive

STEP CHANGE
CONTINUOUS IMPROVEMENT

Reactive

SURVIVAL
CATCH UP

Strong
Weak

Type of Improvement defined. Feed into the process below

Survival  Step Change  Catch Up  C.I.
HIGH  MEDIUM / HIGH  MEDIUM / LOW  LOW

Record degree of urgency

Undertake culture analysis. Use Table 43 (Appendix 7)

Figure 28: Flow Chart of Model
Figure 28: Flow Chart of Model
The first activity to be carried out when applying the model is to develop a statement of ‘whys’ and this becomes the outcome of this stage. Sheet 1 of the management action sheets (see Figure 28, Box ‘A’) can be used as a guide to help with the development of a statement of whys. The information provided in Box ‘A’ is not intended to be comprehensive but is to be used as an indication of the type of statement that can be developed as an outcome of this stage. The importance of this stage is to ensure that the management team has an agreed understanding of why they need to change. In many cases this need is obvious and self-explanatory but one of the reasons for developing the statement of ‘whys’ is to attempt to secure management commitment and unity at the earliest opportunity. The importance of management commitment was confirmed during the literature review and case studies.

The process used to introduce the Tenneco kaizen initiative was planned and developed by the management team. It was evident that there was top down commitment and interest from the beginning. The OCD cellular manufacturing initiative was introduced over a relatively short time period, with top down commitment, appropriate resources and bottom up involvement and was introduced into one functional unit.

The literature review and the case studies confirmed that many initiatives were seen to falter because of a lack of management commitment; this stage of the model is an initial attempt to address this issue. The expected outcome of this stage is an agreed statement from the management team explaining why there is a need for change or business improvement and this statement will be written in box ‘B’ on the model.

At this point the model splits into two paths; illustrated by path 1 and path 2 in the flow diagram, Figure 28. Path 1 looks at the development of objectives, performance measures and the selection of tools and techniques, whilst path 2 investigates the organisational setting and looks at more intangible issues such as culture. The two paths converge towards the end of the model in order to merge the full implementation strategy and undertake the analysis using the IMP. Progress along paths 1 and 2 and the research behind the stages of the model is described below.
Path 1: Development of objectives and improvement techniques

Following the statement of whys from box 'B' the next activity is identification of the whats. This is an attempt to focus the change effort and ensure clarity of reasoning for the change. This is another process that supports understanding, unity of purpose and helps to develop commitment within the management team. Again, similar to the box of whys the box of whats (Figure 28, Box C) can be used as a guide for this activity. The outcome is a number of objectives developed by the management team that will need to be achieved by the organisation.

One of the conclusions from the case studies was that measurable business improvement objectives, developed, agreed and bought into by the management team have to be agreed up front. A fundamental requirement of policy deployment, again confirmed during the case studies was the need for clear objectives and targets to be agreed up front by the management team. Further evaluation of the case studies identified that one of the contributing factors to sustainability was that measurable business objectives must be defined and agreed up front and that these have to be developed, agreed and bought into by the management team.

The case studies indicated that the number of objectives was not critical in itself (between 2 and 5 appeared to be the norm for successful organisations) but the objectives needed to be focused rather than broad. The three most successful initiatives in the Case Study exercises each had focused objectives. The purpose of this stage of the model is to develop focused, appropriate objectives for the organisation.

Following development of the whats, written as top level objectives, the next stage is to determine the hows. This stage will identify appropriate tools and techniques that can achieve the whats identified in the previous stage. The list of hows was taken from the survey questionnaire developed in Chapter 4. Section 4.2 explained how the content of the questionnaire was developed using a brainstorming session with a group of
manufacturing managers, and from reviewing a selection of literature (Schonberger 1996, Euske & Player 1996, Grint 1997, Wallace et al 1994). A relevance factor for each initiative was developed using the information and ranking system shown in Appendix 8 and including quality and the supply chain. Sheet 1 of Appendix 8 shows the total relevance score for each of the initiatives against a specific objective. For example, Total Productive Maintenance has a total score of 80 against the 'reduce costs' objective and this consists of the sum of the scores for the strategic and operational areas. An example of how each individual score for each factor was developed can be determined by looking at Appendix 8, sheet 3. This illustrates how the score for each factor for strategic cost was developed. A number of key activities were rated as to their relevance for each initiative, 5 being highly relevant to 0 having no relevance. The score of 20 for TPM was developed according to this scale. Similarly Appendix 8, sheet 4 shows how the score of 40 was obtained for TPM. This process was undertaken for all the initiatives against the 5 factors shown in Appendix 8, sheet 1. From this information Table 33 was developed as a guide to specific initiatives or 'hows' that are relevant to specific 'whats'.

It is important to understand that Table 33 should be used, by the management team, as a means of provoking discussion about the selection of appropriate tools and techniques that can be used to satisfy the objectives established to date. It is also important to emphasise at this stage that no indication or consideration of the method of implementation would or should have been discussed. This helps to encourage open minds within the management team regarding the applicability of the technique used to achieve the whats. The final stage of path 1, before merging with path 2, is to determine the measures and objectives that can be used to support and maintain the change process. The importance of this stage is again supported by the outcomes of the case studies and information from the literature review regarding the importance of aligning performance measures with the business improvement objectives.
Table 33: Identifying the Hows, Examples of Initiatives that Might Help

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Reduce Costs</th>
<th>Increase Flexibility</th>
<th>Reduce Waste</th>
<th>Increase Speed</th>
<th>Improve Quality</th>
<th>Develop Supply Chain</th>
<th>Improve Customer Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean Manufacturing</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Just-in-Time</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Business Process re engineering</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>Cellular manufacturing</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total productive Maintenance</td>
<td>R</td>
<td></td>
<td>H</td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply chain management</td>
<td>R</td>
<td></td>
<td>R</td>
<td>R</td>
<td></td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Design of Experiments</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kanban</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>H</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>Theory of constraints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>TQM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>Kaizen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>Quick changeovers</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concurrent engineering</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benchmarking</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Poka yoke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5S</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>FMEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>SPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R</td>
</tr>
</tbody>
</table>

Note:  
H - Highly relevant  
R - Relevant

Table 34 was developed to help management choose appropriate performance measures to monitor the success (or failure) of the change process. It is vital at this stage to ensure that the measures developed align with the objectives that have been agreed. The focus is to develop a balanced set of top-level measures that can help to drive the improvement process.
Table 34: Identifying Performance Measures, some Examples and Possible Top Level Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reduce Costs</th>
<th>Increase Flexibility</th>
<th>Reduce Waste</th>
<th>Increase Speed</th>
<th>Improve Quality</th>
<th>Develop Supply Chain</th>
<th>Improve Customer Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>£s saved</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profit margin</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product R&amp;D costs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process R&amp;D costs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on Assets</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OEE</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Capital Investment</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of quality</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Inventory turns</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Time to market</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P:D ratio</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% sales from new products</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer complaints</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of process improvements</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer satisfaction index</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer PPM</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier PPM</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘site’ PPM</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manf lead time</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>No. of new product intros</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of new model intros</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 34 was developed from the research undertaken on performance measures in Section 2.2.6. Note that a process to deploy the measures throughout the organisation will also need to be considered at a later stage. Care should be taken when developing the top-level measures as the data collection process must support the measures without becoming too much of a burden on the organisation. Also the experience and broad business approach of the management team is essential to ensure that the performance measures developed and used do not conflict with other initiatives or strategic objectives currently being pursued within the organisation.
To summarise, the outcomes of path 1, which feed into box 'D' on the flow chart, are as follows:

- Identification of the whats and an agreed management statement of whats. Almost a top-level statement of intent. A number of business objectives that have been developed and agreed by the management team.
- Identification of appropriate tools and techniques through discussion and agreement by the management team. The hows that can support the achievement of the whats.
- A number of performance measures that will benchmark and monitor progress of the initiative. At this stage these are likely to be top-level strategic measures.

Using the model to develop the outcomes described above requires management involvement and decision making at a very early stage and is designed to ensure management support and commitment to the improvement programme at each stage as illustrated in Table 32.

Path 2: The Organisational Setting

Path 2 of the model was designed to investigate and record the organisational setting and considers issues such as the 'type of change', urgency of change and culture. Path 2, like Path 1, is initiated by the statement of 'whys' recorded in box 'B' on the flow diagram. The development of the first stage in Path 2 is based on the work of Strebel (2000) who identifies the importance of proactive and reactive change and whether the forces of change are weak or strong.

Strebel defines a reactive change force as one in which the management team and the organisation need to respond to external circumstances: proactive change forces are concerned with developing opportunities for change to improve the business even when the business is doing well. In this situation, the decision by the management team is to determine whether the change is an opportunity, where the external forces for change
have yet to affect performance, that is, a proactive force, or the alternative where the external forces for change are affecting performance, a reactive force.

The next decision made at this point is whether the force for change, be it proactive or reactive, is strong or weak. The two decisions, reactive/proactive and strong/weak are then combined to provide a definition of the change. These decisions enable the nature of the change to be defined and this is an important statement that is noted in box 'E' (Figure 28). The outcome in box 'E' will be either proactive weak, proactive strong, reactive weak or reactive strong. The model worksheets in Appendix 7 provide a more detailed, working description of the change force decision process.

This statement of change (box 'E') is important as it is fed into the improvement definition grid in order to identify and define the type of improvement that is being considered. Four types of improvement are identified related to whether the force for change is weak or strong and whether the need for the change is related to a proactive or reactive situation. These four types are:

- Step Change
- Survival
- Continuous Improvement
- Catch Up

Each of the four types is described in more detail below.

Step Change
Step change falls in the proactive/strong category on the grid. Step change is closely linked to breakthrough ideas and opportunities and usually refers to an opportunity to introduce a new process or initiative that can have a radical effect on the organisation. The approach adopted in this research is to firstly determine how the step change can be introduced and then to examine how the benefits can be sustained. As discovered during the literature search and case study work, innovative breakthrough ideas, step change or improvement initiatives often become flavour of the month fads. The
challenge is to sustain the benefits as well as the initial burst of activity that is often followed by no action and eventual disappointment. Step change, as defined, is regarded as an opportunity that is not yet affecting the organisation, but is a distinct opportunity to steal a march on the competition.

Survival
This fits the reactive/strong force category. The main difference from the previous scenario, innovation, is that external effects are already starting to hit the organisation. It is likely that if no action is taken then the competition will gain a significant competitive advantage, which at best will lead to a loss of business but at worst could lead to the end of the business. The requirement is for urgent action followed by ongoing consistent activity in order to reduce the losses and in the longer term to sustain the benefits.

Continuous Improvement
Recognised in the grid by proactive/weak forces for change. This does not mean that the weak forces are not important but at this stage, there is no evidence of the competition doing anything different and the external forces are having no measurable effect on the organisation.

The paradox of this situation is that this is often the most appropriate situation for the organisation to be able to introduce real, sustainable change. The problem is that because there is no observable pressure on the company then it is the situation that is least likely to enforce change. This situation requires strong, sustained action by the management team in order push continuous improvement activities forward.

Catch Up
This is a situation in which there are weak/reactive forces for change acting on the organisation. If no action is taken at this stage then it is possible that the business will fall behind the competition and eventually fall into survival mode. Again there is
pressure on the management team to create a sense of urgency in order for the organisation to take appropriate action. This may be difficult if the consequences of not taking action are not immediately recognisable or seem insignificant to other problems that may exist in the organisation. Once the type of change is defined it is recorded in box ‘F’ on the flow chart, Figure 28. The next stage is to feed this information into the degree of urgency required box. The outcome of this, which should be recorded in box ‘G’ will enable the appropriate degree of urgency to be recorded. Matching the degree of urgency required to the degree of urgency that is likely will enable suitable and sufficient resources to be considered and applied.

The next stage of Path 2 is to undertake an analysis of organisational culture. The importance of an organisation having a culture that supports change has been noted by a significant number of authorities (Ansoff 1988, Schein 1991, Kidd 1994, Sheridan 1997). Also the case studies, notably the Tenneco - kaizen initiative recognised the importance of culture and culture change for ongoing, sustainable improvement. However, at one level this can be considered to be a simplistic truism as the activities and action involved in successful change help to create a culture that is more inclined to welcome and support further change which, in turn, makes successful change more likely – Figure 29.

![Figure 29: Change / Culture change relationship](image)
However, organisations and management teams consistently undervalue the importance of culture. This step of the model is designed to ensure that its importance is given sufficient emphasis. To enable the organisation's culture to be understood and discussed a culture analysis process (Table 35) was developed from a number of sources, including a series of questions related to analysing organisational culture (Armstrong, 1990 and Allen, 1997).

### Table 35: Culture Analysis Process

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There is an emphasis on positive rewards for improvement activities.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>People given guidance and support by their managers when they are needed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>There is a general feeling of warmth and good fellowship in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>People feel they are part of a worthwhile company.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>People feel they are valuable members of working teams.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>People are empowered to make decisions and take action.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>When things go wrong they are viewed as a learning opportunity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>People know what is going on in the organisation—they are well informed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>There are feedback mechanisms related to people’s performance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Performance measures are used for improvement.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Performance measures are visible to everyone.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Management are open about what is happening in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>There is an emphasis on bringing problems out into the open.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>There is an emphasis on risk taking in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Problems are solved ‘at source’.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>People are happy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Attendance is generally above the average for the industry.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>There is a history of innovation and improvement in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>The approach to work is generally flexible and informal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>When things go wrong the culprit is traced and suitably punished.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>There is a lot of bureaucracy and red tape in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Playing safe is more likely than risk taking?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Problems have to go to a manager for discussion and approval before attempting to solve them.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>There is a feeling of mistrust between management and the rest of the workforce</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The questionnaire helps each member of the management team to identify the dominant culture within their organisation. The second part of the process is to use the individual results obtained and encourage participants, as a team, to discuss key areas from the analysis and cultural indicators to make an informed judgement of the organisation's
culture. Four organisational cultures, based on the work of Handy (1983) were used to identify and agree which of the four cultures is the predominant one in their organisation.

Completion of the questionnaire and the management discussion provides an indication of the dominant culture within the organisation based on four cultures, supportive/open, neutral, apathetic and hostile. The four cultures are described below and are based on the work of Handy (1983), who suggested four cultures, power, role, task and person and also to a lesser degree Allen (1997).

Supportive/Open
This culture supports and embraces change. The organisation has a strong, successful record of continuous improvement and innovation. There is likely to be an open management style with effective communication processes and a positive supportive approach to change. People feel that they are part of the organisation and there is a high level of trust within the business.

Neutral
There is generally a cautious approach to change within the organisation and the management team and it is unlikely that there is the same level of commitment and excitement that is evident in the supportive/open culture described above. The management team and the workforce will tend to be supportive of change initiatives but need to be constantly supported and 'nudged' along. Change is not a natural activity for the majority of employees but there is an underlying positive potential for change which currently remains largely untapped. It is possible that there is a lack of suitable techniques or sufficient knowledge within the organisation which may act as a barrier to change within this culture.

Apathetic
This culture is closely associated with a bureaucracy that has existed for many years in an extremely stable or predictable market. This links very closely to the role culture
described by Handy (1983) and briefly introduced in Section 2.2.2. This culture is slow to perceive the need for change and slow to change even if the need is seen. It can be extremely difficult to introduce change within this type of organisation as quite often the organisation believes that it is too big to be affected by the external forces.

Hostile
This relates to a culture that is outwardly against or 'hostile' to change. This could be because they are fed up with the concept of change as they have been subjected to miracle cure after miracle cure. Another reason could be that the organisation has suffered from change initiatives that may have resulted in significant job losses or some other negative outcome for the employees. There is also a lack of trust between the management team and the rest of the workforce.

The next box on the model, box 'H', on path 2 is used to summarise the information discussed and agreed so far. At this stage it is recommended that the current situation is summarised. The areas that should be recorded are:

- Type of change
- Degree of urgency required
- Organisation culture related to change

Thus applying the model to a real situation could provide the following information at this stage, for example:

<table>
<thead>
<tr>
<th>Type of change</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of urgency required</td>
<td>High</td>
</tr>
<tr>
<td>Organisation culture</td>
<td>Apathetic</td>
</tr>
</tbody>
</table>

or alternatively, for example:

<table>
<thead>
<tr>
<th>Type of change</th>
<th>Catch up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of urgency required</td>
<td>Medium / low</td>
</tr>
<tr>
<td>Organisation culture</td>
<td>Supportive</td>
</tr>
</tbody>
</table>
It is must be emphasised that the outcome is important, but just as important is the debate, discussion and agreement undertaken by the management team to arrive at the outcomes. The next step is to feed these outcomes into the next activity of path 2 and use Figure 38 - Appendix 7 - to compare and establish the degree of urgency required with the degree of urgency anticipated within the organisation. To make it easier to follow the process, Figure 38 is reproduced below.

**SURVIVAL**

![Survival Diagram]

**STEP CHANGE**

![Step Change Diagram]
Figure 38: Degree of Support and Urgency Graphs (reproduced from Appendix 7)
Figure 38 consists of four charts which link to the four change processes previously described - survival, step change, improvement and catch up. The charts illustrate a number of important factors.

- The likely degree of support for the change in respect of the urgency of the organisation in responding to or supporting the change initiative.
- The urgency level required
- The four cultures

From this analysis and subsequent discussion an evaluation is made regarding the degree of urgency required against the likelihood of support and the perceived degree of urgency within the organisation.

Using the previous example and the summarised outcome above the information can be applied to Figure 38 to clarify how this stage works. The outcomes were:

- Type of change - Survival
- Degree of urgency required - High
- Organisation culture - Apathetic

Evaluation of Figure 38 shows that these outcomes must be considered against the survival curve which is reproduced in Figure 30. The four curves, catch up, survival, step change and continuous improvement, illustrated in Appendix 7, were developed to enable the 'urgency level mismatch' to be evaluated and are based on information regarding 'degree of urgency' and change processes from Strebel, (2000), Senge (1999) and the four cultures described earlier.
Examining the survival curve, Figure 30, shows that the urgency level required by the organisation is indicated as high. It was previously identified that the organisation's culture is apathetic. When the change support curve was investigated a mismatch between the urgency required and the degree of urgency that is likely from an apathetic culture is observed. This results in an urgency level mismatch as illustrated in Figure 30. The next stage of the model takes account of this mismatch and guides the management team to make a decision regarding the most appropriate improvement method to be used.

Table 44 (Appendix 7) is designed to summarise the current situation and to provoke discussion related to the development and agreement on appropriate actions for the change process. These range from a top down to a bottom up approach but can also be a combination of approaches based on the discussions held by the management team and using the recommendations in the Table. These approaches are based on experience and also relate to typical approaches adopted for specific initiatives. For
example teamwork is recommended as an appropriate approach to kaizen (Imai, 1986) and a pilot to prove approach is a typical tactic used when introducing a major initiative such as Lean Manufacturing.

Again the importance of open and frank discussion within the management team cannot be over emphasised. The need for cultural change and the degree of match or mismatch between the degree of urgency required and the likely degree of urgency can be debated, discussed and evaluated and if necessary a plan developed to undertake the appropriate actions.

At this stage the outputs from path 2 and Table 44 are amalgamated with the outputs from path 1 to produce the plan for action. It is also at this stage that questions need to be asked relating to the process of implementation such as training needs and communication.

The final activity is to use the IMP – Table 45 - to evaluate the likelihood of success of the approach developed by the application of the model. It is important to note that the IMP will give an indication of success at a particular point in time based on the identified criteria. It was initially recommended that the IMP is re-applied in its ongoing format, as shown in Table 46, at agreed intervals to help to sustain the change initiative. However, as a result of further research, described later, this was not proved to be practical. The IMP was based on the outcomes of the case studies and was also designed to measure and monitor progress over time and to support sustainable improvement. The development of the IMP was based upon analysis of the information developed in the case studies. High scores in specific areas strongly supported a successful implementation of an improvement initiative. For example, the initiatives that succeeded had a percentage achievement of goals rating of 83%, 100% and 92%. Similarly the percentage success in respect of ‘other changes’ was recorded as 90%, 88% and 75% respectively. The failed initiatives scored 58% and 29% for achievement of goals and 59% and 29% for the percentage success in respect of other changes introduced.
These scores tend to reinforce the need for clearly defined goals to be developed and agreed up front. Figure 31 shows how each of the initiatives scored against achievement of goals and other changes.

![Figure 31: Achievement of Goals and Other Factors](image)

<table>
<thead>
<tr>
<th>Key to Figure 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>B1</td>
</tr>
<tr>
<td>B2</td>
</tr>
<tr>
<td>C1</td>
</tr>
<tr>
<td>C2</td>
</tr>
</tbody>
</table>

Not surprisingly, the initiatives that were regarded by the companies as successful ranked highest against the two scales shown in Figure 31 and the least successful initiatives were both at the lower end of each of the axes.

Other factors identified as strongly contributing to the success of an initiative were:

- Clear objectives and whether they were focussed or not.
- Aligned, focussed performance measures.
- Management commitment.
Using this information the IMP was developed and this is shown in Table 36. The IMP was initially tested using the information from the case studies and Table 37 provides a summary of the outcomes of this exercise.

Applying the IMP to the case study exercises - see Table 37 - indicated that it gave a very good indication of the success of each of the case study initiatives. A major drawback of the IMP was identified as its limited ability to indicate the potential success of an initiative prior to commencing implementation. It was useful as an ongoing monitoring tool but had a limited application as a pre-initiative measurement process. This was primarily because the first two columns were specifically scored in respect of the percentage success actually obtained. For this reason a further version of the IMP was developed and used within the final model (Table 45). An overview of the key contributions to the development of the model is shown in Appendix 9.
Table 36: Initiative Measurement Process

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiative</td>
<td>% achievement of goals</td>
<td>% success</td>
<td>Key objectives</td>
<td>key measures</td>
<td>Top down commitment</td>
<td>Score</td>
<td>Company Rating</td>
</tr>
</tbody>
</table>

| No. | B or F | Score | No. | Results | Score |

**Explanation**

Column 1: Indicates the initiative being considered

Column 2: % achievement of goals based number achieved against those undertaken

Column 3: % success in respect of other changes

Column 4: Key objectives pursued. No. – number, B – Broad (2 points), F – Focused (10 points)

Column 5: Key measures used. No. – number, Results 0 – not successful (0 points), Y – results successful (10 points)

Column 6: Top Down Commitment for initiative. N – No (0 points), Y – Yes (50 points)

Column 7: Total score for each initiative

Column 8: Company rating of whether initiative is deemed as ‘successful’ or ‘unsuccessful’ (for comparison with score)

Note that only one row is shown as the tool is designed to be used with separate initiatives. Table 36 shows a comparison of initiatives, which were attempted during the case study exercises.
Table 37: Initiative Measurement Process – Scored Comparison of Case Studies

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% achievement of goals</td>
<td>% success</td>
<td>Key objectives</td>
<td>key measures</td>
<td>Top down commitment</td>
<td>Score</td>
<td>Company Rating</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>B or F</td>
<td>Score</td>
<td>No.</td>
<td>Results</td>
<td>Score</td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>58</td>
<td>59</td>
<td>5</td>
<td>B</td>
<td>10</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>A2</td>
<td>83</td>
<td>90</td>
<td>2</td>
<td>F</td>
<td>20</td>
<td>6</td>
<td>Y</td>
</tr>
<tr>
<td>B1</td>
<td>82</td>
<td>89</td>
<td>4</td>
<td>B</td>
<td>8</td>
<td>4</td>
<td>Y</td>
</tr>
<tr>
<td>B2</td>
<td>100</td>
<td>88</td>
<td>3</td>
<td>F</td>
<td>30</td>
<td>4</td>
<td>Y</td>
</tr>
<tr>
<td>C1</td>
<td>29</td>
<td>29</td>
<td>1</td>
<td>B</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C2</td>
<td>92</td>
<td>75</td>
<td>5</td>
<td>F</td>
<td>50</td>
<td>6</td>
<td>Y</td>
</tr>
</tbody>
</table>

Explanation:
Column 1: Indicates the initiative being considered (see Figure 30 for key)
Column 2: % achievement of goals based on number achieved against those undertaken
Column 3: % success in respect of other changes
Column 4: Key objectives pursued. No. – number, B – Broad (2 points), F – Focused (10 points)
Column 5: Key measures used. No. – number, Results 0 – not successful (0 points), Y – results successful (10 points)
Column 6: Top down Commitment for initiative. N – No (0 points), Y – Yes (50 points)
Column 7: Total score for each initiative
Column 8: Company rating of whether initiative is deemed as ‘successful’ or ‘unsuccessful’ (for comparison with score)
For clarity Table 38, is a summary of the model and the stages and tools used at each stage.

Table 38: A Summary of the Model and the Stages and Tools Used at Each Stage.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Path</th>
<th>Activity</th>
<th>Support Process</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>Develop statement of 'whys'</td>
<td>Model – Box 'A'</td>
<td>Statement of 'whys' in Box 'B' of model</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Identification of 'whats'</td>
<td>Model – Box 'C'</td>
<td>Number of key objectives</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Determine the 'hows'</td>
<td>Table 41</td>
<td>Tools &amp; techniques that will help to achieve objectives</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Determine key measures</td>
<td>Table 42</td>
<td>Balanced set of top level measures</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Summary of path 1</td>
<td>Box 'D'</td>
<td>Summary of path 1 outcomes</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Decide whether change force is proactive or reactive</td>
<td>Model</td>
<td>Statement in Box 'E'</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Decide whether change force is weak or strong</td>
<td>Model</td>
<td>Statement in Box 'E'</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Evaluate improvement type</td>
<td>Improvement definition grid – model</td>
<td>Type of improvement defined in Box 'F'</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Agree degree of urgency required</td>
<td>Degree of urgency box on model</td>
<td>Degree of urgency recorded in Box 'G'</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Analyse organisational culture</td>
<td>Questions in Table 43</td>
<td>Agreement within team of overarching culture within the organisation</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>Summarise path2 progress to date</td>
<td>Box 'H' on the model</td>
<td>Summary of path 2 progress</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>Match culture with change requirement, degree of urgency and support required</td>
<td>Figure 38</td>
<td>Evaluation of degree of urgency required against likely urgency level in the company – 'gap' analysis</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>Determine and agree summary of actions and requirements</td>
<td>Table 44</td>
<td>Summary of outcomes from path 2 and a plan for undertaking actions</td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>Amalgamate path 1 and path 2 information</td>
<td></td>
<td>Plan of requirements, performance measures etc.</td>
</tr>
<tr>
<td>15</td>
<td>-</td>
<td>Apply IMP</td>
<td>Table 45</td>
<td>Success potential score – a risk analysis</td>
</tr>
<tr>
<td>16</td>
<td>-</td>
<td>Evaluate and discuss the success potential score and outcomes. If acceptable then go to next stage. If not acceptable then investigate the weak areas and re-apply the IMP and continue through the loop until an acceptable process and core is obtained.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>-</td>
<td>Apply the plan…..Monitor success through the performance measures and regular applications of the IMP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

205
6.3 Testing, Proving and Refining – The Pilot Study

The model is designed to be used with a management team in a manufacturing organisation that is considering a change initiative or is possibly under pressure to do something. Its aims are to develop an implementation process, through management discussion and agreement, which will result in an increased likelihood of success and sustainability of the improvement. The model was tested through an initial pilot study followed by three experiments that are described in detail in section 6.4. The same version of the model was used for each experiment and the outcomes were reviewed afterwards – Figure 32,

![Diagram: Pilot Study Flowchart]

**Figure 32: The Experiments**

The specific objectives for each experiment were:

**Pilot Study:**

To test the model's logic and flow through a 'thought' experiment.

To evaluate the usefulness of the outcome of the model application.
Experiment 1: Brecon Pharmaceuticals
To test and validate the model's logic and flow with a management team

Experiment 2: Therm Tempered Limited
To test and validate the model's logic and flow with a senior management team using a current initiative and a potential initiative.

Experiment 3: Panasonic
To test and validate the model's logic and flow against an initial and ongoing application of an initiative and to investigate its suitability as an ongoing improvement tool.

6.3.1 The Pilot Study
The pilot study was based on a manufacturing company in South Wales that employs 250 people to manufacture telecommunications equipment. The model was applied by and tested with the Operations Manager of the company. The application was based around the management of inventory and work-in-progress (WIP) at the company as current levels of stock at £10m were at too high a level for the organisation. A target to reduce this by 20% over a period of 12 months had been discussed; whilst the operations manager felt that a 50% reduction over a 2-year period was feasible. The main objective of the pilot study was to test and validate the model's logic and flow and secondly that a useful outcome resulted from its use. It was an opportunity for the researcher to have a dry run before testing the model in a live situation.

6.3.2 Applying the Model
The pilot study required the Operations Manager and researcher to work through the model and develop and record the outcomes at each stage as they applied to the organisation. This activity is described below.
Developing the Statement of whys

Through discussion between the Operations Manager and the Researcher and using the model as a guide it was agreed that there was an opportunity to reduce costs within the business and release cash. At present there is corporate pressure on the organisation to cut costs but there was no specific pressure to actually reduce inventory or WIP. This can be regarded as an opportunity to introduce new ideas and use the management team to re-shape the supply chain and the internal processes. Thus the statement of whys for this particular situation was defined as:

'Reduce costs within the business and free up cash'

Statement of whats – key objectives

Using the model guide sheets (Appendix 7) and evaluating the organisation in discussion with the Operations manager, the main objectives developed for a potential initiative or improvement activity were to:

- Reduce inventory from £10m to £8m over a 12 month period
- Reduce inventory over a 2 year period from £10m to £5m
- Reduce waste within the supply chain
- Reduce waste within the order fulfilment process
- Improve supply chain management
- Develop a strategy for management of supplies

Identifying the hows

This stage identified possible initiatives or elements of initiatives that would support the achievement of the objectives defined earlier. The Operations Manager used Table 41 together with the key objectives listed above to identify the following underlying techniques or potential hows.

- Lean Manufacturing
- Supply Chain Management
- Just-in-Time
- Business Process Re-engineering
Performance Measures

The objectives listed earlier were aligned with the performance measures by the Operations Manager using Table 42 as a guide and the following performance measures were developed for the potential initiative:

- Inventory Turns
- £s saved
- P:D ratio
- Manufacturing lead time
- Supplier defects – measured in parts per million (PPM)

Define the Nature of the Change

The proposed initiative is a reaction to the need to reduce the cash tied up in inventory. The force for change currently within the management team is weak. There is no pressure, yet, on the company to change although this is likely to alter in the near future. From the grid the type of improvement is identified as Catch Up.

The degree of urgency required, as perceived by the analysis undertaken was ranked as medium. However, following a discussion with the Operations Manager it was agreed that the degree of urgency was likely to change to 'high' in the near future so it was agreed to describe the current degree of urgency as 'medium/high.'

Culture Analysis

The Operations Manager completed the culture questionnaire and scored the organisation at 58. This indicated a culture of apathy within the company. Discussion about the organisation's culture was then held with the Operations Manager using the descriptions of culture provided by the model. It was agreed that a culture of apathy was a very accurate description of the general culture that exists within the organisation - including the majority of the management team.
Summary of path 2 progress

Type of improvement required – catch up
Degree of urgency – medium/high
Culture – apathetic

The next stage was to compare the culture (apathetic) with the change requirement (medium / high), using Figure 38 as a guide. It was necessary to explain the use of Figure 38 in some detail to the Operations Manager before this exercise could be completed. The outcome of the comparison resulted in a significant mismatch between the degree of support for the change and the degree of urgency required being identified.

It was now necessary to develop the most appropriate option for the potential change initiative whilst accounting for the significant mismatch between the degree of support for the change and the degree of urgency required identified in the previous stage. This was developed by discussion and using Table 44 as a guide. The outcome of this stage identified the following options for the implementation process:

- Pilot Study – bottom up
- Pilot study – top down
- Management team driven
- Forced change

After further discussion it was decided that the potential initiative should be top down, management team driven and commence with a pilot study. There was a problem with the degree of urgency required against the likely degree of urgency that will initially be generated. Culture change is necessary within the organisation and the management team.

The final stage was to evaluate the percentage potential success rating using the IMP and the result of this application is shown below.
IMP initial analysis

The use of the IMP was explained and the Operations Manager worked through the process by applying the information previously generated during the application of the model. The objectives were analysed, the performance measures reviewed and the culture and top down commitment were rated by the Operations Manager – Table 39 - resulting in a potential success rating of 50%

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six Objectives: Two were focused and four were broad.</td>
</tr>
<tr>
<td>Key measures used 5, all aligned.</td>
</tr>
<tr>
<td>Culture, apathetic</td>
</tr>
<tr>
<td>Top down commitment</td>
</tr>
<tr>
<td>Total score</td>
</tr>
<tr>
<td>Maximum score possible for 6 objectives and 5 key measures</td>
</tr>
<tr>
<td>Potential Success Rating</td>
</tr>
</tbody>
</table>

Table 39: Summary of IMP Application - Pilot

6.3.3 Discussion

Although the pilot test of the model and associated techniques was limited in its objective, it involves a real organisation and a valid potential initiative. The results of the pilot test suggested a need to work on management commitment and the culture of the organisation in such a way as to raise the commitment to effecting change. It was suggested that a positive way of doing this was to undertake a management driven pilot exercise in one area to test and prove the ideas and attempt to raise the commitment of the management team and the workforce. A need to raise urgency of the management team was also identified and a pilot study may support this. Application of the IMP suggested a potential success rating of 50%.

The current situation within the company is that the management team have delayed the project due (in their opinion) to a lack of funding. However, the Operations Manager,
who has since left the organisation, explained that the project was rejected by the management team as they saw no real need for it, at present. There was, in his opinion, no commitment from the management team. This tends to confirm the outcomes recorded from the application of the model especially the significant mismatch between the degree of support for change within the organisation and more specifically the management team (apathetic) and the degree of urgency required from the management team to enable the performance improvement to be successful.

6.3.4 Critical Evaluation

Applying the model to this situation was a useful activity resulting in a series of outcomes and recommendations. The limitation of the pilot study was the obvious lack of management involvement and discussion, which would have helped to develop management commitment and probably raised more issues and opportunities. It is interesting to note that the management team has postponed this project, an action, which tends to support the lack of management commitment identified by the model.

The use of the model identified the main issues in the organisation and provided a guide to the likelihood of success through the application of the IMP. The objective behind the pilot experiment was to test the model's logic and flow through a 'thought' experiment based on a realistic setting. It can be concluded that carrying out the pilot study, albeit through a 'thought' experiment was a success as it helped to provide confidence in the flow of the model and its stages and logic. An important result of the pilot was an indication that the evaluation of the 'hows' and the 'urgency gap' needed to be made clearer. A second drawback was that although the pilot was undertaken in conjunction with an Operations Manager the analysis was 'driven' by the researcher. As a consequence, the possibility was recognised that the researcher's familiarity with the model may have given an inaccurate picture of its ease of use.

However, it was recognised by the Operations Manager that the model did flow as a process and achieved the required outcomes at each stage, albeit with some assistance.
from the researcher. It was decided, therefore, to carry out the three experiments at Brecon Pharmaceuticals, Therm Tempered Limited and Panasonic Computer Products Europe - Service Centre without any modifications to the model. Details of each of the experiments together with conclusions and recommendations follow in Section 6.4.

6.4 Testing the Model using Three Experiments

6.4.1 Introduction

This section describes how the model was tested through three separate experiments at Brecon Pharmaceuticals, Therm Tempered Limited and Panasonic Computer Products Europe Service Centre. In order to broaden the research and provide information and feedback from a range of industry sectors it was decided to use these three organisations from outside the automotive sector because the results from the survey indicated that companies from the automotive sector had attempted many initiatives. Section 6.5 discusses the outcomes and conclusions reached from the experiments and section 6.6 provides examples of further work that could be undertaken to develop the model further. Information on each company was gathered which informed the selection of the company for a specific experiment. The initial information that influenced the choice of companies was described in section 3.4, the specific information that influenced the choice of each company and the experiment that was undertaken was as follows.

Brecon Pharmaceuticals

- They had attempted to introduce an initiative (Lean/5S)
- This initiative had failed
- They were looking for a way forward
- The middle management team was available
- They were willing to look at a structured approach
Therm Tempered Limited
- They were currently trying to introduce a new initiative and it wasn't working
- They were looking for a way forward or an alternative
- Senior management team were available
- Good opportunity to test the model and the IMP

Panasonic
- Opportunity for a test over a longer period
- Availability of key influencers
- Opportunity to test the model and its effectiveness over time

More detailed reasons for selection of the companies are presented in the write up for each of the experiments. The objectives developed for each experiment were:

Experiment 1: Brecon Pharmaceuticals:
To test and validate the model's logic and flow with a management team

Experiment 2: Therm Tempered Limited
To test and validate the model's logic and flow with a senior management team using a current and future initiative.

Experiment 3: Panasonic Computer Products Europe
To test and validate the model's logic and flow against an initial application and its suitability as an ongoing improvement tool.

The section begins with a description and review of Experiment 1.
6.4.2: Experiment 1: Brecon Pharmaceuticals

Purpose of the Experiment
To test and validate the model's logic and flow through a controlled application with a group of managers in a manufacturing Company.

Method
The experiment was carried out over two, half days in June 2004. The process and feedback required to carry out the experiment was as follows.

1. Presentation on the research and background to the model to the team.
2. Work through the flow chart – to give an overview and broad understanding
3. Work through the model and the IMP
4. Ask for specific feedback from the group regarding:
   a. The process of evaluating an initiative using the individual elements of the model and associated techniques.
   b. The logic of the model
   c. Outcomes
   d. Ease of use
   e. Opportunities and ideas for improvement of the model
Introduction and Background

Introduction to the Company

Brecon Pharmaceuticals was established in 1979 to provide a high-quality packing and distribution service to the pharmaceutical industry. After ten years of operating in the domestic market the company established a global partnership with ProClinical Pharmaceutical Services, based in Philadelphia, USA. In 1998 this partnership enabled Brecon to offer an international service encompassing formulation development, analytical services, small-scale manufacturing, packaging, storage and distribution. The company has grown significantly, with a 20 per cent increase in turnover in each of the past three years and is now an audited and approved supplier to over 70 major pharmaceutical and healthcare companies worldwide.

Brecon's business falls into two categories. The first is commercial packaging of established products on behalf of the brand owner. The second is clinical trials supplies which involves packing pharmaceutical products not yet on the market for distribution to trial centres, nationally or internationally. This has generated a wealth of in-house experience and established Brecon Pharmaceuticals' reputation as an innovative service provider. This has resulted in the development of a number of new services and facilities in response to customer requests, including high-speed blister packaging, sachet filling and upgraded bottle filling capabilities.

Brecon's declared mission is to 'achieve growth through excellence,' both for itself and for its customers. The company has a commitment to quality and substantial ongoing investment in facilities and staff training are central to their philosophy. To demonstrate this philosophy Brecon has received accreditation to the revised ISO9000 Quality Management Standard, ISO9001:2000, the 'Investors in People' national Standard and also holds ISO 14001.
At the time of the research Brecon had plans to double the size of its operation at the Wye Valley Business Park to cater for its continued growth. The construction of a new 45,000 sq ft business unit commenced in late Spring 2004 to create new state-of-the-art production and warehouse facilities to complement Brecon’s existing operation. The company employs around 250 staff and this latest expansion will ultimately take Brecon’s workforce to over 330 personnel, making it one of the largest employers in the region. This latest development has been prompted by ongoing growth in demand for Brecon’s clinical trial supply and commercial packaging services.

Introduction to the Participants

The participants in the experiment were a group of middle managers who, with the exception of the Continuous Improvement Manager, had been with the company for a minimum of three years. The Continuous Improvement Manager had been with Brecon Pharmaceuticals for just under a year, but due to her key role within the organisation it was agreed that she should be part of the team involved in the experiment. The team members are listed below:

- Helen Smart - Clinical Trials Production Manager
- Mandy Stephenson - Clinical Trials Supervisor
- Jo Large - Continuous Improvement Manager
- Charlotte Lloyd - Label Group Technician
- Sherrie Gore - Warehouse Team Leader

Selection of the Company and the team

In addition to the reasons discussed earlier it was concluded that Brecon Pharmaceuticals would be an ideal company to test and validate the flow of the model experiment for the following reasons.

- The researcher had previously worked with the organisation and had good links with the management team.
- Brecon Pharmaceuticals is growing and changing.
- The company had already tried (unsuccessfully) to introduce Lean Manufacturing principles and 5S.
- The company was prepared to release a team of people for two, half days to participate in the experiment.
- The individuals released were known to the researcher and this provided a degree of confidence that they would be open, honest and speak their minds.
- The individuals were keen to participate.
- The Continuous Improvement Manager was keen to evaluate further opportunities to introduce improvements.
- The team had excellent knowledge of Brecon Pharmaceuticals.
- The team had some knowledge of improvement techniques.

Conducting the Experiment

Preparation

A presentation on the background to the research and an overview of the model and the outcomes expected at each stage was given to the group. The purpose of the presentation was to set the scene for the participants and to provide an overview of how the model would be used and applied. A copy of the slides used for the presentation is shown in Appendix 10A at the end of this experiment.

During and after the presentation the group provided feedback about Brecon Pharmaceuticals and also their initial perception of the model and how it worked. Some of the problems with improvement from a Brecon Pharmaceuticals perspective were discussed and identified:

- The management team not thinking through the possible issues
- A failure to backup and follow through by management to sustain an improvement initiative
- Improvement initiatives often start off well but fade quickly
- The operatives don't like or want change
- Everyone is too busy 'doing' to become involved in improvement
- Hard work.....not easy to change

**General comments from group members:**
The group members were satisfied that the presentation gave them an overall feel for the model although they raised a slight concern that it appeared to be quite complicated and 'heavy'. They confirmed that the model seemed to make sense and appeared to be logical, however, they also emphasised that they would have a better understanding of the model when they had worked through it. The group pointed out that in their experience culture was rarely if ever considered at Brecon Pharmaceuticals when introducing an improvement initiative. A final comment was that even though some of the initiatives are easy to understand they are difficult to implement

**Initial Familiarisation**
The next activity was to work through the flow chart to provide a more detailed overview of the process. The group found it quite difficult to fully appreciate and understand the stages of the model using the flow chart as it was a theoretical explanation rather than an actual worked exercise. For this reason this activity was quite short and it was agreed that it would be advantageous if the application of the full model took place, using the flow chart as a guide.

**Applying the model**
The model worksheets (Appendix 7) were worked through systematically and in detail with the group with the researcher taking the role of the facilitator. This process, whereby the team undertook the evaluation with the researcher facilitating, is a step forward from the pilot where the researcher did the evaluation in collaboration with a single manager. Each
stage of the model was explained using the model itself and the flow chart for extra clarity. The team applied the model to Brecon Pharmaceuticals and developed the required outcomes for each individual stage (See Appendix 10B). Finally the IMP was discussed and applied and a potential success rating was developed for Brecon Pharmaceuticals (Appendix 10C).

Summary of the model application and outcomes

Statement of whys

Brecon Pharmaceuticals is going through a period of growth with a recent new development likely to create around 80 new jobs to add to the existing workforce of over 250. This latest development has been prompted by ongoing growth in demand for Brecon's clinical trial supply and commercial packaging services and further supports the company's declared mission of "Growth through Excellence". Thus the main driver for improvement is growth and the statement of whys was agreed by the team to be introduce and develop processes that will help to:

'Manage significant, planned growth'

Following the development of the statement of whys it was now necessary to develop a set of relevant top-level objectives. These were discussed and agreed and eventually developed to be:

- Increase the responsibilities and flexibility of the production operators
- Improve the speed of the order fulfilment process
- Identify and reduce waste in the order fulfilment process
- Reduce the number of quality checks whilst improving the levels of quality

Identifying the hows

This stage required identifying specific improvement initiatives that would fit the objectives developed above. Using Table 41 as a guide and the key objectives the following 'hows' were agreed for Brecon Pharmaceuticals:
- **Flexibility**

To improve the ability of the manufacturing process to respond to an increasing number and size of customer orders it was suggested that Kanban could be used to control the flow of materials. To reduce the time taken to change from one job to the next the introduction of Quick Changeovers was identified.

- **Speed**

  - Quick changeovers
  - Lean Manufacturing in the order fulfilment process
  - 5S – will help to find things easier and reduce search time
  - Identify and reduce waste

- **Quality**

  - Poka-Yoke, to develop a preventative approach to quality problems
  - FMEA – to anticipate potential issues
  - Kaizen – to develop a structured, team based, problem solving approach to quality issues and problems

**Performance Measures**

This stage required the development of performance measures which would measure progress against the objectives set and also fit with the process at Brecon Pharmaceuticals. Table 42 was used as a guide for this activity. The measures agreed were:

  - P:D ratio
  - Manufacturing Lead Time
  - Cost of Quality
  - Inventory Turns
  - No. of customer complaints
Define the Nature of the Change

The objective of this stage was to determine whether the change force was strong or weak, proactive or reactive. This classification enabled the nature of the change to be described and the degree of urgency to be identified.

The change was classified as reactive as the forces for change were affecting the organisation at that time and it was agreed by the team that the forces for change were strong. Surprisingly an outcome of the analysis was that the nature of the change was described as 'survival'. However, when discussed with the management team it was agreed that a failure to manage growth properly would definitely lead to a loss of business and, over the long term, this could severely damage the organisation if customer confidence was significantly damaged.

The degree of urgency required, as identified by the model was high, however, further discussions resulted in the management team agreeing that the degree of urgency was medium/high. This was due to the understanding that the growth was to be managed over a two year period although it was agreed that because of the volume of work that needed to be undertaken, the urgency level should be rated as medium/high.

Culture Analysis

The purpose of this activity was to develop an understanding of the culture through completion of the culture questionnaire by the team members followed by discussion. The application of the questionnaire resulted in the following individual scores for the organisation from each of the team members – 52, 52, 58 and 44 – resulting in an average
score of 52. This indicates an apathetic culture and it was agreed through discussion that this was an accurate description of the prevailing culture within the organisation. One of the main areas of agreement was the amount of bureaucracy and red tape within the company.

Summary of Path 2 progress
Degree of urgency – medium/high
Culture – apathetic
Type of improvement required – Survival

Culture match with change requirement
The next stage was to examine Figure 38 and apply the information to the appropriate graph. This evaluation showed that the information has to be considered against the survival curve. Examination of the survival curve shows that there is a mismatch between the degree of likely support for the change and the degree of urgency required. This was discussed and agreed by the management team.

Most appropriate option for the change initiative
It was suggested that poka-yoke would be an appropriate initiative to use to start the improvement process. Following clarification of the process and further discussion and debate, it was agreed that the most suitable process to use in order to ensure the improvement process satisfied the 'urgency' requirements and fitted the culture was to undertake a pilot study (top down) that would be tightly controlled, managed and driven by the management team. When the improvement started to show benefits it would be encouraged to grow outwards across the workforce.

IMP initial analysis
Appendix 10c An initial analysis was undertaken using the IMP. The process used to carry out this exercise was to firstly determine whether the objectives developed for the
organisation were broad or focused. The four objectives developed for the organisation were:

- Increase the responsibilities and flexibility of the production operators
- Improve the speed of the order fulfilment process
- Identify and reduce waste in the order fulfilment process
- Reduce the number of quality checks whilst improving the levels of quality

It was decided by the team that the first two objectives listed above were broad, whilst the last two objectives were more focused. The main reasons behind this decision were that the last two objectives were more specific and measurable than the first two. This resulted in a score of 22 for key objectives, each focused objective scored 10 points, broad objectives scored 2 points each.

The next step was to examine the performance measures. Eight measures were identified, see above, and it was agreed that these measures aligned with the objectives that had been developed. Aligned measures are given 10 points each, resulting in a score of 80 for performance measures. The culture score was 12 which represents the apathetic culture agreed through the questionnaire and discussion earlier. It was agreed that there was top down commitment although this was not total and so this was given a score of 40 out of a maximum of 50. The full results are shown in Appendix 10c, an overview of the outcomes of the application of the IMP are shown below.

- Key objectives identified 4, 2 focused, 2 broad.  = 24
- Key measures identified 8 = 80
- Culture, apathetic = 12
- Top down commitment = 40

Note: maximum score attainable = 220
The score of 154 gave a 70% success rating. This score is based on all the Performance Measures being in place and used. The score without the performance measures being in place was reduced to 74, giving a 34% success rating.

Outcomes for the Organisation:
Applying the model indicated that there was a need to work on the general culture of the organisation. A positive way of doing this is to undertake a management driven pilot exercise in one area to test the ideas and develop commitment within the management team and the workforce. There is a need to raise the urgency level and a pilot study may support this. The objectives are clear but could benefit from being more focused and specific. Also, application of the IMP provided strong evidence that the performance measures identified need to be introduced and used.

It was agreed by the team that as well as developing and introducing the performance measures the first practical improvement stage would be a top-down, management controlled pilot exercise in an identified area. After further discussion the team agreed that a poka-yoke application would be undertaken in one of the manufacturing cubicles in order to improve the quality and also attempt to reduce the inspection based mindset in the area.

One surprising outcome, to the researcher, was the interpretation of the improvement initiative as 'survival' when the organisation is going through a growth situation. When challenged the team was unanimous in their support for this outcome as they believed that 'if we don't grow, then we will die.' The culture questionnaire was a source of much discussion and the team again, unanimously, agreed with the outcome that the culture was apathetic and that it would take a considerable amount of sustained effort to successfully move the business forward in line with the objectives we had proposed. This provided a degree of confidence in the accuracy, practicality and usefulness of the culture questionnaire.
The team agreed that the exercise had been useful and that the model, with some modifications as described, would be an extremely effective tool and would help to support and sustain improvement.

Outcomes for the Research
The following comments were provide by the team during and after the application of the model described above.

The Process
The team was generally supportive of the process used to work through the model. The order used to arrive at outcomes for each stage and the final stage were described as 'logical', based on 'common sense' and 'straightforward, what needs to be done and do it'.

The Individual Elements
The team made comments and provided feedback on each of the individual elements of the model these were:

- Liked the culture questionnaire
- Graphs made sense after explanation
- The graphs need facilitation. They would be difficult to understand if working through on your own
- Performance measures need more explanation and development, a separate sheet with a description and definition of each would be helpful.
- Don't like 'H' and 'R' on Table 41, a key on the bottom of the sheet would help
- Culture change required on Table 44, blank area not clear. The sheet needs to be improved and clarified.
- The link between the model and the flow chart could be improved possibly by colour coding.
The Logic

Further feedback was provided on the logic of the model. The team suggested that it had a logical order and it made good sense. However, there were concerns that although the two paths made sense, this was only after the outcomes from the application of the model had been completed. ‘It was hard to see where we were going on times’.

Flow

The team agreed that on reflection there was a logical flow to the process. However there was one area of concern in that they felt that they had ‘lost the drift because of the two week break in the sessions. It was quite difficult to pick up from where we left off’.

Outcomes

There was full agreement that the outcomes of the model were relevant and meaningful. It was also recognised that culture change was important, there is a need for involvement, feedback and for the management team to listen. A positive quote from the CI Manager regarding the outcomes was:

‘Helps me it was very useful’

Ease of Use

The team suggested that the application of the model in its present form must be facilitated. They indicated that It would be difficult to use if it was not facilitated and that it would need ‘lots of notes and guidelines.’

Opportunities / Ideas for Improvement

The team suggested a number of possible refinements

- The culture questionnaire would be even more useful if there was a lot more people input
- The culture questionnaire would be more accurate if more people were involved
- More information and descriptions on each of the initiatives is required
- Simplify the measures – definition chart
- The link between the flow chart and the model could be improved, possibly by colour coding

The original aim of this experiment was
'To test and validate the model's logic and flow through a controlled application with a group of managers in a manufacturing Company.'

The application of the model to Brecon Pharmaceuticals was successful in testing the model against this aim. The team provided useful feedback and the outcome from the application of the model was logical and appropriate to Brecon Pharmaceuticals.

The experiment raised a number of suggestions and ideas that can be used to develop the model. It also became evident that the model, in its present form, relies heavily on a skilled facilitator to assist the management team to work successfully through the stages. However, the model was specifically designed to be used with a management team and the use of a facilitator can be regarded as necessary to control and manage the contribution of the team as well as to facilitate the individual stages of the model.

The comments relating to each of the stages of the model and the information / Tables used were extremely useful and were taken into account in the final re-design of the model. Table 41 has been altered to clarify the rating scheme. The outcome from the comments was that the use of 'H' and 'R' was both confusing and unnecessary and these have been be replaced by an x. Table 47 shows a modified version of Table 41. The comments relating to the blank area of Table 44 were also noted and considered with comments from the other experiments resulting in the development of Table 48 which is an adapted version of Table 44.
Difficulty in understanding the performance measures and the range of initiatives described in the Tables could be reduced by developing a glossary of terms or more detailed descriptions of each of these factors. The link or flow between the development of the objectives, the hows and the performance measures worked very well, but required a significant amount of explanation from the facilitator, especially in explaining the meanings behind some of the performance measures that were suggested.

One of the key outcomes of the model and the IMP was the importance of introducing and using relevant performance measures that could be used to monitor the improvement process. The likelihood of success increased from 34%, with no relevant measures being in place a projected 70% if the aligned measures were put in place and used.

To conclude, the experiment was successful in that it tested and validated the model’s logic and flow and a number of suggestions were made that could improve its usefulness and functionality.
6.4.3: Experiment 2: Therm Tempered Limited

The model used was the same version that was used for the Brecon Pharmaceuticals and Panasonic applications. The difference in this experiment, from the Brecon Pharmaceuticals application was that the process used to apply the model was different and the model was used to evaluate a current initiative and a potential new improvement.

Purpose of the Experiment

To further test the model's logic and flow and its use as an intervention tool with three senior managers in a manufacturing company.

Method

The experiment was carried out over a two week period. The process was:

1. Overview of the model to the Operations Director using the flow chart – to give an overview and broad understanding.
2. Work through the model with the Operations Director.
3. Overview of the model to the Financial Director and Managing Director using the flow chart – to give an overview and broad understanding.
4. Work through the model with the Managing Director and Financial Director.
5. Re-visit the outcomes with the Operations Director, Financial Director and Managing Director and agree a consensus based outcome.
6. Discuss and review the current approach to 5S and Lean Manufacturing based on the outcomes of the model and the IMP score.
7. Consider the best way forward for Therm Tempered Limited.

The rationale was to test the use of the model in a less 'researcher controlled' environment than the Brecon Pharmaceuticals application for a new initiative and also to test its use against an initiative that was currently ongoing.
**Introduction and Background**

**Introduction to the Company**

At the time of the experiment Therm Tempered Limited employed over 200 people at its processing, manufacturing and distribution facility in Pontyclun, Mid Glamorgan. Therm had the capacity to temper (toughen) its glass to meet British Standards and was approved to ISO 9002 for quality management, BS 5713 for Sealed Units and BS 6206 for toughened safety glass. In 1992 the turnover was less than £1 million and a steady expansion saw that grow to £7.5 million by 1999. A programme of major capital investment in the last few years enabled Therm Tempered to grow to a turnover of almost £13 million in 2003.

Therm has two Tamglass toughening plants and three semi-automatic lines for production of dual sealed units. Therm maintained a mix of products with a huge range of decorative and patterned glasses and the company recently opened a specialist Georgian bar factory unit. The company's product range included annealed and toughened insulated double glazed units plus single toughened glass and a full range of bespoke (decorative) stained and bevelled designs. Therm Tempered markets its products to a range of industry sectors including building, glazing, local authority markets and the conservatory sector.

**Introduction to the Participants**

The participants in the experiment were the Senior Management Team, two of whom (Operations Director and Managing Director) were recent additions to the company whilst the Financial Director had been with the company for over four years. The Operations Director was recruited approximately 18 months prior to the experiment with a remit to introduce modern manufacturing practices into the business with a corresponding improvement in business performance. The three members of the Management team were:

- Kevin Jones - Operations Director
- Richard Jones - Financial Director
- Neil Blewitt - Managing Director
Why Therm Tempered Limited?

Following more in depth discussion with the company it was concluded that in addition to the reasons discussed earlier Therm Tempered Limited and the senior management team were suitable for the experiment for the following reasons.

- There was a remit to change and improve the organisation.
- The company was currently attempting to introduce Lean Manufacturing principles and 5S and were finding it difficult to progress.
- The individuals were keen to participate.
- The Operations Director was keen to evaluate further opportunities to introduce improvements.
- The team had excellent knowledge of Therm Tempered and of the future strategic direction of the business.
- The team had a knowledge of improvement techniques but had little experience of applying the techniques in the glass industry.
- There was an opportunity to test the usefulness of the model in a live situation.

The above reasons and the availability of the senior management team to commit to the experiment made Therm Tempered Limited an ideal organisation for this experiment.

Conducting the Experiment

Preparation

A discussion regarding the background to the research and an overview of the model and the outcomes expected at each stage was held with the Operations Manager and separately with the Financial Director and Managing Director. This was a different approach from the Brecon Pharmaceuticals application as the team was not all available at the same time. The purpose of the discussion was to set the scene and to work through the flow chart to provide a more detailed overview of the process and of how the model would be used and applied. The next activity was application of the full model using the flow chart as a guide.
Applying the model

The model was worked through systematically with the Operations Director and secondly with the Financial Director and Managing Director with the researcher taking a coaching role i.e. providing support and direction and resolving any questions and issues that arose. Each stage of the model was explained using the model itself and the flow chart for extra clarity. The Operations Director applied each stage of the model to Therm Tempered and developed the required outcomes for each stage. The Financial Director and Managing Director also completed the model again developing outcomes for each stage. The next stage required the three directors to work together and what ensued was an extensive discussion based around the outcomes of the model by the three directors with the researcher again acting as facilitator. Eventually, consensus was reached regarding the outcomes of the model and discussions were held on the most appropriate way forward. Finally the IMP was discussed and applied and a potential success rating was developed for Therm Tempered.

The model application and outcomes

The outcomes shown below are the consensus outcomes agreed by the three directors (see Appendix 11A). Separate summaries of the Operations Director's and the Financial Director/Managing Director's feedback are shown in Appendix 11B and Appendix 11C. The first action was to agree the statement of whys and this resulted in:

Statement of whys

- Business Growth and business improvement
- New ideas – opportunity

Following further discussion and support from the facilitator the statement of whys was condensed into the following statement:

'An opportunity to use new tools and techniques to improve the business and manage the potential growth opportunity'

Therm Tempered was experiencing a period of growth at the time of the application of
the model. An initiative to introduce Lean Manufacturing techniques through initially applying 5S principles as a foundation was in the early stages of development. The initiative was not progressing as quickly or as successfully as the organisation had originally anticipated and this was justification for the application of the model.

Following the development of the statement of whys it was now necessary to develop a set of relevant top-level objectives. These were discussed and after discussion and debate by the three managers were eventually agreed to be.

- Reduce waste (non value added)
- Increase speed
- Improve quality
- Improve supply chain
- Reduce costs

Identifying the hows

This stage involved identifying specific improvement initiatives that would support and achieve the objectives developed above. This was quite difficult as not all members of the management team understood the initiatives / improvement processes that could be used. However, using Table 41 as a guide and the key objectives determined above the following 'hows' were developed and agreed for Therm Tempered:

- Lean Manufacturing (costs, speed, quality, supply chain)
- 5S (Costs, waste, Quality)
- BPR (Costs, waste, speed, quality, supply chain)
- Poka-Yoke (quality)

Performance Measures and Targets

This stage required the development of performance measures which would measure progress against the objectives set and also fit with the process at Therm Tempered. Table 42 was used as a guide for this activity together with the input from the management team regarding specific measures currently used at Therm Tempered. The measures agreed were:
• Reduce customer complaints by 30%
• Reduce material usage, from 40% to 36%
• Delivery 100% with maximum negative variance of 2%
• IMP

Path 2:

Define the Nature of the Change

The initial objective was to determine whether the change force was strong or weak, proactive or reactive. This classification would then enable the nature of the change to be described and the degree of urgency to be identified.

The team debated the change classification and agreed that the nature of the change was mainly proactive as the forces for change were not currently affecting the organisation. However, there was an interesting discussion within the management team before agreement was reached that the forces for change should be described as strong. The Operations Director, based on his experience within other organisations, convinced the other two directors that there was a strong need for change. When the definition of 'Step Change' was shown to the management team the key words from the definition that enabled the team to feel comfortable with their outcome was ‘an opportunity to introduce a new process or initiative that can have a radical effect on the organisation.’

The next stage was to use the model to determine the degree of urgency required and it was initially decided to be medium / high. However, further discussions by the management team regarding the opportunity to 'steal a march' on the competition, as described in the definition of Step Change, resulted in the management team agreeing that the degree of urgency could be regarded as high.
Culture Analysis

The purpose of this activity was to develop an understanding of the culture through an application of the questionnaire contained in the model and further discussion. The application of the questionnaire resulted in the following scores for the organisation – 47, 40, 52 resulting in an average score of 46.

This suggests an apathetic, almost hostile culture. Further discussion by the management team, especially related to the progress of the current initiative, resulted in the culture being rated closer to the hostile description. It was eventually agreed that the culture would be described as apathetic/hostile. One of the major factors to support this decision was the lack of success and the lack of support and degree of opposition to the current 5S initiative.

Culture match with change requirement

This stage required an examination of Figure 38 and application of the information to the appropriate graph. This required the information to be applied to the step change curve. Examination of the step change curve showed that there was a significant mismatch between the degree of likely support for the change and the degree of urgency required. This mismatch was discussed and it was agreed that this was an area of considerable concern.

Most appropriate option for the change initiative

Table 44 was used to guide a discussion relating to the most appropriate method of introducing step change in a hostile environment. This required explanation and guidance from the researcher together with a considerable amount of discussion and interaction from the management team. The outcome was that the team identified that to increase the possibility of success, within Therm Tempered Limited, a forced change was required that would be driven by the management team. It was also concluded that major culture change was required throughout the organisation, including the management team.
Most appropriate option identified for the change initiative

The outcome of the model from the management team's discussions implied that forced change, driven by the management team was the most appropriate method for the change initiative. It was also noted that major culture change including the management team was required. Currently the approach being used within the company was to use 5S as a foundation tool to establish a baseline for further improvements, such as Lean Manufacturing. The objective was to drive 5S through one of the production units - B3 - on a pilot basis. The current approach depended heavily on the input of an external consultant plus support from the middle management team and shop floor operators within the defined area.

The outcome from the model and the appropriateness of the current initiative was, at this point, discussed by the management team. In order to provide further objectivity to the discussion the researcher suggested applying the two change opportunities to the Initiative Measurement Process (IMP). This was undertaken and the potential success rating for the current 'live' initiative was scored at 23% (Appendix 11D) whilst the potential success rating for the initiative developed through the model was 57% (Appendix 11E). Not surprisingly this became a point for further discussion within the management team and it was agreed that the first action would be to suspend the current initiative being carried out in B3.

The management team found it more difficult to reach agreement on whether to progress using the outcome of the model with only a marginally greater than 50:50 chance of success. This score required aligned objectives and performance measures and there was a degree of concern that the control and management of the initiative and the measures would be difficult considering the apathetic, hostile culture of the middle management team. A discussion was then held to consider potential options and a number of other suggestions were raised and discussed, a summary being:

- Use the senior management team and develop more focused, measurable approach working with the middle management team
Communication to the shop floor people in order to start developing commitment at this level.

Process changes to engage the shop floor and encourage their involvement. Also introduce audited procedures to manage progress.

Introduce process changes focused on key measures and results for individual managers and team leaders, again audit progress against these requirements.

Introduce education and training of managers then use the middle management team to support senior management and drive improvement through the organisation through the application of specific projects.

Continue the improvement initiative in B3 as a pilot.

Introduce a training and development programme at all levels of the organisation, with specific projects, to create change agents or champions throughout the organisation.

It was also noted that whichever opportunity was adopted major culture change would be required, starting with the middle management team. Again after further discussion and consideration of the factors involved it was felt that the best approach, to develop sustainable improvement would be to start with education and training of the middle management team and then use this team, with the support of Senior Management, to drive improvement. It was agreed at this point to undertake an IMP evaluation of this approach and this is shown in Appendix 11F. The outcome of the exercise was that the potential success rating increased from 57% without training, to 84% after training. Even though the degree of urgency was evaluated as 'high' and this was a more careful, measured approach the Senior Management Team believed that in the long term this approach would not only produce good results but would provide a foundation on which future initiatives could be introduced.

Feedback from the Senior Management Team

The senior management team was asked to comment on the process of discussion and evaluation that they had completed. The main comments were:
'The model was quite difficult to follow and it was doubtful whether it would work without a facilitator.'

'The culture questionnaire was an eye opener.'

'The culture questionnaire gave us a different perspective on our business. We have never really considered culture previously.'

'The model did not produce a solution but certainly helped us to reach a satisfactory outcome.'

'The IMP was useful as a benchmark and also helped to provide some objectivity to our choice of how to move forward.'

'I wish we had had this discussion before we undertook the initiative in B3.'

'The model has some fuzzy areas. It wasn't clear, even at the end, whether our objectives were broad or focused or whether our performance measures were fully aligned.'

'The list of initiatives were useful but were only fully understood by the Operations Director. Could there be case studies or some other information to illustrate the benefits of the initiatives more clearly?'

'The model requires an independent facilitator to make sure the process flows properly and to guide the discussion.'

'The eventual outcome makes good sense but may be slower than we originally anticipated.'
'The performance measures, like the list of initiatives, would benefit from some examples.'

'Doing it separately (i.e. Operations Director and then Financial Director / Managing Director worked through the model) helped because we had an understanding of the process before the team discussion.'

Outcomes for the Company

The purpose of this experiment was:
'To further test the model's logic and flow and its use as an intervention tool with three senior managers in a manufacturing company.

The experiment was carried out at Therm Tempered Limited. Applying the model to Therm Tempered proved to be successful as the outcome reached by the management team has now been introduced into the organisation. Also, as a result of the analysis using the model the current initiative has been suspended until the senior management team is confident that the middle management culture is more supportive. The team provided useful feedback on the application and use of the model, that will be discussed in more detail in the next section.

Outcomes for the Research

The experiment raised a number of points and suggestions for further discussion and consideration. There was relatively little feedback or concern expressed regarding individual elements of the model such as specific Tables and Graphs. However, there was a significant amount of feedback of a more general nature regarding the overall functioning of the model and its outcomes.

It was the opinion of the senior management team that the model would not work in its current form without the support of a skilled facilitator. This was not surprising as at that
time the model was still in a developmental stage. It is also likely that the final version of the model will be designed to accommodate some means of facilitation in order to guide the management discussion and direct them through the process.

The comments relating to the culture questionnaire provided further evidence of its usefulness within the model and also confidence of its ability to identify and describe the prevailing culture within an organisation.

The feedback on the application of the IMP was positive regarding how it helped to put a degree of objectivity to the outcomes and enabled a decision to be made on the most appropriate way forward. However, the confusion regarding broad and focused objectives through a lack of understanding within the senior management team was slightly concerning and needed to be further investigated. Also the need for examples or case studies that would help to clarify the benefits and describe typical applications of each of the initiatives listed was noted. It was recognised that the experiment could have been significantly delayed when discussing appropriate initiatives if it not for the knowledge and experience of the Operations Director and the facilitator.

It was also recognised, by the senior management team and the researcher, that the outcome was not a perfect 'solution' but a compromise of sustainability and urgency based on the need to change the culture of the organisation. However, it is important to emphasise that this outcome would not have been reached without the support of the model to the discussions that took place.

To conclude, the experiment was successful in that it tested and validated the logic and flow of the model and proved that the model could be used as an intervention tool. Further credibility was established for the culture questionnaire and the IMP and also a number of suggestions were made that could improve its usefulness and functionality.
6.4.4 Experiment 3: Panasonic Computer Products Europe (PCPE) Service Centre

Purpose of the Experiment
To test and validate the model's logic and flow through the development of an improvement process and then to test its suitability as an ongoing improvement tool. To achieve this the model was tested by developing an improvement process and then through applying it over a 5 month period to identify and evaluate:

- the model's effectiveness and workability, short term and longer term
- the usefulness of the IMP
- opportunities for improving the model
- how the model supports sustainable improvement

This experiment was designed to initially develop an initial improvement process for the organisation and then to test its success by monitoring the improvement over a 5 month period.

Method
The experiment was carried out over a 5 month period between February and July 2004. The process was:

1. Initial application of the model with the participants
2. Development of a plan for action
3. Regular planned progress reviews
4. Final review of progress and feedback

Introduction and Background
Introduction to the Company
Background Information
Panasonic Personal Computer Division (PCPD) was founded in 1996 to assemble and configure laptops to the specific requirements of European customers. The focus of the company was to target the commercial market, with the core of the business being
Heavy Duty Ruggedised units, which can operate in normal and extreme weather conditions. Often customers required specific configurations or solutions that did not exist. CPE's ability to respond to customer's requirements and the reliability and features of the product resulted in them winning large contracts with organisations such as British Gas, British Telecom and the A.A. The large size of these accounts has helped to establish the product and it is estimated that there are close to 500,000 Panasonic Laptops currently in use throughout the UK and Europe. These are sold through a network of individual Panasonic Sales companies throughout Europe and initially each sales company was responsible for the service and repair of any faulty units.

In 2000 the company started a Pan European Service Centre, at Cardiff, to improve the control and management of the level of service offered to customers. Instead of each individual sales company servicing faulty laptops a dedicated facility was introduced to reduce duplication and improve the level of service offered. The service expanded rapidly, to meet increased sales, and in 2001 the CPE Service Centre moved into larger premises within the main site at Cardiff.

The CPE Service Centre provides warranty and repair facilities for all Panasonic Laptops sold to U.K. and European Customers. The facilities include:

- A Helpdesk to deal with enquiries and the logging and tracking of a repair and support for technical problems

- A logistics team to effectively manage the receipt and despatch of laptops and the control of spare parts

- A fully operational repair facility with specialised engineers and technicians who can diagnose and repair faults and defects.
The Service Centre currently employs around 50 staff (approximately 30 Permanent and 20 Temporary). This includes two recently opened facilities at Leicester dedicated to British Gas and BT repairs. The management structure for the Service Centre is as follows:

![Management Structure Service Centre CPE](image)

**Figure 31: Management Structure Service Centre CPE**

The Managing Director of CPE takes responsibility for the Service Centre and the Operations side at Cardiff. He links with the Managing Director for the whole business who is based in Germany and also has responsibility for sustaining a close relationship with R & D and engineering in Japan. For this reason the Managing Director at CPE is usually a Japanese national. The management and development of the Service Centre is controlled by the Service Centre Team Leader.

**Introduction to the Participants**

The participants in the experiment were the Service Centre Team Leader and the Service Centre Administrator. There were a number of reasons why CPE Service Centre and the Service Centre Team Leader and Service Centre Administrator were
appropriate for this experiment. The Service Centre Team Leader has been with the Organisation for 2 years and had a good knowledge and understanding of the issues and opportunities within the Service Centre. Also he had previously worked in an organization that had exposed him to business change and improvement using a range of improvement initiatives. Finally, both individuals were keen to participate and were open to ideas and suggestions.

**Why Panasonic Computer Products Europe?**

Following further discussion with the company it was felt that Panasonic Computer Products Europe was suitable for this experiment for the following reasons.

- The rapid growth of the Service Centre was creating a requirement for change and improved business processes
- There was an expectation that 5S principles would be practiced within the organization. The Service Centre Administrator had been appointed as the 5S champion and coordinator.
- The Service Centre Team Leader had the authority to introduce improvements.
- There was an opportunity to apply the model and the IMP over a 5 month period
- The Senior Management team recognised the need to move the organisation forward

Finally, the company was happy to allow the researcher to work with the two company representatives over the 5 month period and to record information and measure progress.

**Conducting the Experiment**

**Introduction**

The experiment was carried out over a period of 5 months from the 10th February 2004 to the 7th July 2004. During this period an initial application and review was followed by
a series of review days. The Service Centre Team Leader and Administrator were responsible for driving forward specific actions when identified during the review sessions. Every review session was facilitated by the researcher. The sessions held were as follows:

- Initial Application and Review (10/02/04)
- Development of performance measures and 5S process (17/03/04)
- Further development of Performance Measures & 5S Review (15/04/04)
- Review of Progress (04/05/04)
- Review of Progress (27/05/04)
- Final Review of Progress (07/07/04)

This process was used to develop and agree the initial improvement actions from the model application and to monitor the ongoing progress of the initiative over a 5 month period.

Details of the Experiment

Preparation, Initial Application and Review

The Service Centre Team Leader and Administrator were provided with an overview of the model using the flow chart and the management guide sheets. The next step was that the Service Centre Team Leader and Administrator, supported by the researcher who acted as a facilitator, used the model to produce an initial review. The outcomes of the review held on the 10th February is shown in Appendix 12A.

The main reasons for improvement were identified as growth, customer pressure and to a lesser extent corporate pressure to improve the overall performance of the Service Centre. Because of their knowledge of the Service Centre and its business aims, it was relatively straightforward for the Team Leader and Administrator to develop the key objectives which were:

- Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005
- Increase throughput to support 200 units per week whilst maintaining TAT
- Reduce the number of bouncers
- Measure test quality and reduce in line with a plan over the next 6 months
- Identify and pinpoint problems earlier in the process
- More accurate forecasting for spares
- Reduce Lead Time for spares
- Offer a repair service for products for 7 years

Identifying the 'hows' proved to be more difficult and required a fairly lengthy evaluation and discussion to arrive at an agreed list of hows. Performance measures were easier to identify, some were already being considered and others were developed from the objectives using Table 42 as a guide.

Defining the nature of the change was again a difficult exercise and it was eventually agreed that the change was proactive even though there was a sense of pressure on the Company from customers and corporate management in Europe and Japan. The force for change was identified as strong and the change was therefore defined as a step change.

Using the culture questionnaire to analyse the culture was again an interesting and worthwhile exercise. The scores recorded by each individual were 72 and 90, an average of 81, and the description of culture was discussed and agreed to be neutral with an underlying apathy. It was agreed by both participants that the definition of culture reached was appropriate and relevant to the organization.

Comparing the culture with the graphs in the management guide sheets (Figure 38) showed a mismatch between the degree of urgency required and the degree of likely support for the change. The Service Centre Team Leader and the Service Centre Administrator eventually agreed this outcome after a prolonged discussion and debate with the researcher over the graphs, their use and application.
The options developed were a bottom up approach using 5S and driven by the Team Leader and Administrator and a top down process mapping exercise to identify opportunities to drive waste out of the business processes. In parallel with these activities was an initiative driven by the Team Leader to re-organise the workshop into cells.

After applying the IMP twice, firstly assuming all the performance measures were in place (68% potential success rate) and then with the current situation (47.5% potential success rate) it was decided to progress by:

- developing and introducing the performance measures identified
- implementing 5S
- developing a cellular layout for the workshop by building on the ideas that had already been generated

Comments

The outcome of the two applications of the IMP strongly influenced the decision of how to move forward by re-focusing the organisation on the development and introduction of relevant performance measures. For example, specific measures and actions to measure the progress of 5S were introduced. These were based on individual reviews of designated areas using a 5S review tool designed for each area. Also an audit tool was developed to measure the overall progress of 5S within the Service Centre. It was planned to review each area and measure the overall progress of 5S on a monthly basis. One reason for this was that the current progress of 5S was extremely limited and was mainly recognised as a 'clean up' campaign which was indirectly monitored through occasional visits and comments from Japanese based corporate managers. There was no ownership of 5S within the Service Centre at Cardiff and no measures of progress or improvement. However, it was recognised that applying 5S in a structured, controlled way would realise significant benefits relating to workplace organisation and also that there was underlying corporate pressure to introduce and measure the progress of 5S as an initiative in its own right.
Thus the application of the model resulted in a renewed focus on the use and importance of performance measurement and a further meeting was held to progress this requirement.

Development of performance measures and the 5S process

At this meeting the initial objectives, developed from the application of the model, were discussed and further performance measures which aligned more closely with the Service Centre objectives were discussed and developed.

The full list of Performance Measures now became:

- Turnaround Time (TAT), defined as the time taken from receiving a faulty unit to the delivery of the repaired unit to the customer
- Throughput / Efficiency
- Number of bouncers (returned repairs) - % monthly (external)
- Internal % test failures
- Inventory accuracy – measured by % accuracy of actual numbers in stock against numbers on the computer system.
- Numbers of stock outs
- Lead times for component supply
- Delivery Performance
- 5S measures

Appendix 12B shows the link between the performance measures and the objectives and also gives an indication of the status of each measure.

The second objective was to set up a structure for the development and introduction of 5S. This was achieved by dividing the Service Centre into 9 functional areas:

- Logistics
- Clean
- Diagnostics
A customised review sheet was developed for each area and the overall progress towards 5S was measured using the 5S audit. Examples of a customised review and a completed 5S audit are illustrated in Appendices 12C and 12D. Each area was provided with its 5S score and a list of suggested improvements. Appendix 12E shows a typical list of improvements.

Progress Review

Four reviews involving the researcher, the Service Centre Team Leader and Service Centre Administrator were held between April and July 2004. The first review noted and discussed the lack of progress regarding the development and introduction of performance measures (see Appendix 12F). The second meeting reviewed individual performance measures that had now been introduced. Unfortunately, due to the lack of progress with the development of the performance measures it was difficult, if not impossible, to use the ongoing IMP to measure progress. For this reason it was decided to review progress by re-applying the initial IMP. This resulted in a potential % success rating of 54% which compared favourably with the initial IMP score of 47.5% (Appendix 12j). The improvement was mainly due to the development of more focused objectives and the introduction of a further aligned key measure.

The third progress review showed that the performance measures were being developed and introduced into the organisation. The outcomes from the review, using the IMP and the culture questionnaire, were unexpected. The surprise was that the culture questionnaire scores registered by the Service Centre Team Leader and the
Service Centre Administrator were lower than their original scores (68 & 56 compared with 72 & 90 originally). This resulted in the culture being identified as apathetic whereas previously it had been designated neutral/apathetic. The overall score for the IMP resulted in a success rating of 51% which was mainly due to the development of the additional aligned performance measures. However this improvement was offset by the lower score for culture and the overall effect was that the IMP score of 51% was lower than the previous score of 54%. The completed IMP is shown in Appendix 12M.

The apparent regression of the culture was discussed in some depth and a short action plan – Appendix 12N – was developed to try to remedy this situation. One reason, expressed by the Service Centre Team Leader, for the change in the culture score was that the people were now being exposed to change, through the 5S initiative, and were being asked to take action. The resulting lack of action was becoming more and more transparent (to this team especially) and this influenced the score allocated by them. It was agreed that this observation was important and it would not have been picked up, or even considered, without the use of the IMP and more specifically the culture questionnaire.

The first action during the final progress review was to evaluate the progress achieved using the performance measures and this is summarised in Appendix 12P. One major success was the significant improvement in Turnaround Time (TAT) from 8.5 days to 2.2 days. Other areas where there were encouraging signs were: Throughput, 5S and quality.

Secondly the progress of 5S was reviewed. The graphs in Appendix 12Q show the review score comparisons for the nine areas and the second graph, Appendix 12R, gives an example of progress against the monthly reviews for a typical area, in this case logistics. It was agreed that 5S was definitely moving forward and the measures reflected this improvement.
Reviewing the progress of the total initiative using the 'ongoing' version of the IMP was again extremely difficult. Appendix 12S was developed to attempt to facilitate this activity but the outcome - Appendix 12T – was difficult to quantify and had little value as a measurement of progress when compared with the previous IMP reviews. For this reason, the initial version of the IMP was again used and the results are shown in Appendix 12V. It was encouraging to note that the potential success rating had improved to 59% compared to 55% recorded for the 27th May. It was agreed that a number of factors contributed to this:

- more focus from the management team
- renewed awareness and focus on culture and the positive actions undertaken by the management team had seen a definite change in attitude from some of the shop floor technicians
- The performance measures were continuing to be developed and introduced

The IMP score was extremely encouraging and illustrated that progress had been made. It also highlighted the need to continually focus on culture and to ensure that a suite of aligned, focused performance measures were in place and used.

4. Comments and Feedback

The purpose of the experiment, at Panasonic, was to test and validate the model's logic and flow and its suitability as an ongoing improvement tool.

The model's logic and flow were evaluated when it was initially applied to the improvement opportunity and through the ongoing actions, reviews and outcomes. The initial application of the model was described earlier and comments were made on the outcomes. Further discussion with the two participants raised a number of useful points.

- it was very difficult to identify the 'hows'
- the nature of the change was difficult to define
the culture questionnaire was felt to be helpful in providing a different perspective on change
- using the graphs to match culture to degree of urgency was confusing
- the process was okay to follow but a facilitator was essential
- it seemed long winded at first but eventually made good sense
- the development of objectives helped us to focus on where we were going and what we wanted to achieve
- it was surprising that one of the eventual outcomes was to develop and use appropriate performance measures but this proved to be spot on

The initial application of the IMP provided an objective overview of the potential success of the initiative. Comparing the two scores, one without the performance measures in place and one with, was a major influence in the decision to focus on developing and introducing relevant and appropriate performance measures.

Over the duration of the experiment the usefulness of the model was evaluated through the ongoing application of the IMP. The IMP was extremely successful in keeping the initiative on line and focused and the second application of the culture questionnaire, together with the IMP potential % success rating was a key point in the progress of the initiative and one which surprised the Service Centre Team Leader and the Service Centre Administrator. The main area of concern with the IMP was that the 'ongoing' version was difficult to use and it was agreed that the only way to measure progress using the IMP was to apply the 'initial' version at each of the reviews.

The final review session illustrated the improvements that had been made to the Service Centre and also showed that there was a growing, but important, involvement from the workforce.

During the reviews and through discussion a number of opportunities were identified to improve the model. One suggestion was to develop the model as a computer driven
diagnostic tool. This, of course, is a feasible suggestion from a technical perspective but it is important to emphasise that one of the major benefits of using the model is to encourage the management team to discuss the issues as they arise. The danger with a computer based diagnostic tool is that it could be used by individuals who produce outputs that become the accepted way forward without the essential management discussion taking place.

Developing the 'hows' was difficult and it was suggested that possibly this could have been left until later during the initial application. Also it was felt that detailed descriptions against each of the initiatives would be helpful. It was also suggested that the development of the most appropriate option for the change initiative could be done at the end and again a brief description of the applications and benefits of the options would be useful.

The Service Centre Team Leader and the Service Centre Administrator also believed that the initial application of the model was quite a difficult exercise and maybe should have taken place over a number of short (2 hr) sessions rather than a single day. On a positive note they both felt that the exercise was worthwhile and the application of the model and the ongoing reviews, using the IMP, helped to ensure that the initiatives kept on track.

Conclusions
The experiment was a success in that it tested the model over a period of time and raised a number of useful points for discussion. Also over the 5 month period the Service Centre achieved some real improvements which were discussed earlier and were continuing with the initiative. The objective of testing and validating the model's logic and flow against an initial application and also testing its suitability as an ongoing improvement tool was achieved. However, there were a number of suggestions made which could possibly improve the model. These will be discussed in the next section which will summarise and review the outcomes from the three experiments.
6.5 Discussion and Conclusions

There are many factors to consider when undertaking a business improvement or change initiative. The problem is that executives or managers often fail to consider or even see the many complex issues, such as tradition, culture, and structure that need to be addressed to ensure the initiative is successful. The culture of the organisation, ideally, should be conducive to open and purposeful change in order for the improvement to be successfully introduced and sustained. The culture of an organisation is assessed from the day to day actions and behaviours of its members, including the management team. Organisational culture is established by how management (and the workforce) acts rather than by what it says. Little if any thought is given to the process of implementation and ongoing improvement or sustainability. Consequently, short-term gains are not substantiated and the initiative often loses effect and eventually credibility.

The development of the model was strongly influenced by the secondary research, the main sources of influence being Strebel (1994, 2000), Kotter (1996), Schein (1996), Handy (1983), Senge (1990, 1999) and to a lesser degree Fritz (1999), Burns (1963) and Burns and Stalker (1994). Also the outcomes of the case studies and the resulting IMP scoring exercise had a significant influence on the content of the model and the eventual design of the final IMP process.

The model was tested by four separate experiments that involved its application. The first of these was a pilot study with the model applied by the researcher and the operations manager using a ‘gedunken’ experiment. Following the pilot study three experiments were carried out, at Brecon Pharmaceuticals, Therm Tempered and Panasonic that have been described and analysed. A number of interesting and relevant points resulted from these applications.

The pilot study helped to provide confidence in the flow of the model, its stages and logic. This finding was further supported by feedback from the managers at Brecon.
Pharmaceuticals who suggested that the process had a 'logical order' and that it 'made sense' and the participants from Therm and Panasonic who also agreed that the model had a logical flow and produced meaningful outcomes.

A second finding from the experiments was that the model would have been extremely difficult to use without the aid of a facilitator. Feedback from the Therm management team stated that 'the model was quite difficult to follow and it was doubtful whether it would work without a facilitator.' Similar findings from the Brecon Pharmaceuticals and Panasonic experiments substantiated this comment. In retrospect these were not unexpected findings as the model was specifically developed to be used as a framework for discussion and debate by the management team. In order to achieve a meaningful discussion, debate and an eventual outcome, it is likely that a facilitator will be required. However, the facilitator could be a member of the management team but for this to be effective it would be necessary to develop extensive guidance notes and/or provide training in the use of the model.

One of the most successful stages of the model was the use of the culture questionnaire to encourage the management team to consider and, if necessary, work on changing the culture within their organisation. Brecon Pharmaceuticals suggested that culture change was important whilst Therm not only suggested that the culture questionnaire was an 'eye opener' but also pointed out that it gave them a different perspective on their business as they had not considered culture previously. Panasonic were equally as enthusiastic about the culture questionnaire and suggested that 'it (the culture questionnaire) was excellent and gave a different perspective on change.'

The feedback on the use and accuracy of the culture questionnaire itself was very positive and supported much of the research related to the need to consider culture and the development of the culture questionnaire. A comment from Brecon Pharmaceuticals which suggested that 'the culture questionnaire was a source of much discussion and the team again, unanimously, agreed with the outcome that the culture was apathetic'
was typical of the support for analysing culture and the accuracy of the questionnaire. Developing an understanding of their organisation's culture and the need to tailor an improvement programme to take account of this culture was a new experience for the management teams involved in the experiments. The Therm experience was of particular interest because the understanding of the prevailing culture within the organisation led to a change in approach of their current improvement initiative from a direct intervention to a softer one based on training and educating the management team in an attempt to develop the culture. This formal recognition of culture and subsequent consideration of an appropriate process to introduce and sustain the improvement was not something that, in the experience of the managers concerned, is commonly undertaken.

One of the outcomes of the model, strongly influenced by the IMP potential percentage success rating in Therm and Panasonic resulted in the organisations focusing on developing and introducing performance measures that could be used to monitor the improvements being pursued. However, there was concern expressed regarding the process used to develop the performance measures when working through the model. Brecon Pharmaceuticals suggested that 'performance measures need more explanation and development' and also that the performance measures were difficult to understand. They suggested that this could be overcome by developing a glossary of terms or a more detailed description of each measure using a separate sheet with a description and definition. This view was reiterated by Therm who also indicated that when using the model to identify performance measures the process would benefit from some examples of how and where they could be used.

Business objectives need to be defined prior to the development of realistic and worthwhile performance measures. The process used by the model to force discussion and agreement on its objectives by the team at an early stage was viewed favourably by Panasonic, specifically the Service Centre Team Leader, who stated that 'the development of objectives helped us to focus on where we were going and what we
wanted to achieve'. However, Therm was not convinced that the process of developing effective objectives was sufficiently comprehensive. Even at the end of the experiment Therm expressed concern regarding whether their objectives were broad or focused and whether the performance measures were fully aligned with them. It may be necessary to provide examples of broad and focused objectives possibly using the SMART (Specific, Measurable, Achievable, Relevant and Time bound) approach to highlight the difference between broad and specific performance measures.

The development of performance measures and focused objectives was reflected in the percentage potential success rating indicated by the IMP. The IMP is an attempt to quantify whether the outcomes of the model, measured against a number of variables is likely to result in a successful and sustainable improvement. It can provide further guidance to the management team regarding the most appropriate way forward. This was supported at Therm who suggested that 'the IMP was useful as a benchmark and also helped to provide some objectivity to our choice of how to move forward.' Also the IMP can be applied at agreed time intervals to measure progress and maintain focus for the initiative. This situation occurred in the Panasonic experiment where ongoing use of the initial IMP was extremely successful in keeping the initiative on line and focused. During one specific application of the IMP at Panasonic (27th May 2004) it was illustrated that cultural change was not progressing as planned and this was rectified by appropriate action from the management team. This would not have been identified without the use of the IMP and the culture questionnaire.

One area of concern was the difficulty of using the 'ongoing' version of the IMP (Table 46). For example, in Panasonic the lack of performance measures and performance measurement meant that application of the ongoing version of the IMP would be meaningless as one of its main outputs is to evaluate progress using the performance measures used by the organisation. Because Panasonic was still introducing specific measures, there was no measurable progress to review. For this reason the initial version of the IMP (Table 45) was applied, successfully, as an ongoing measurement
tool. This raised the need for a rethink in respect of the 'ongoing' version of the IMP. One conclusion was that the ongoing version of the IMP should not be used until the performance measures have been fully established within the organisation.

Further comments were received from the three organisations that participated in the experiments. These were linked to specific activities carried out during the application of the model and how they could be improved. The teams at both Brecon Pharmaceuticals and Therm suggested that more information and description was needed against each of the initiatives described in Table 41 as a significant amount of time was used explaining the benefits and use of some of the initiatives listed. Therm suggested the development of examples to illustrate and explain the initiatives more clearly. A glossary of terms was suggested as a possible solution by Brecon Pharmaceuticals.

It was surprising to note that knowledge of the application and benefits of the listed improvement initiatives was not readily understood by the majority of the participants in the experiments. Only the Operations Director at Therm Tempered had a sound knowledge of most of the benefits and use of the initiatives. The development of examples and more detailed descriptions of each initiative needs to be considered further, especially if the management team using the model does not have access to an external facilitator.

Two other areas that were not easy to determine, based on the feedback from the experiments were the development of the 'hows' and the urgency gap. Panasonic had difficulty identifying the hows although Therm and Brecon Pharmaceuticals did not have problems with this exercise. Panasonic expressed concern that using the graphs to match culture to degree of urgency was confusing. Brecon Pharmaceuticals pointed out that the graphs needed a lot of explaining and that they would be difficult to understand if working through them without support from a trained facilitator.
To simplify evaluation of the type of change and make the information easier to understand it was decided to review and restructure this stage of the model. On the original model the grid shown in Figure 34 was used:

![Figure 34: Grid used to define the type of improvement](image)

After conducting the experiments and analysing the results obtained it was decided that two different aspects of change were being investigated within the grid. Catch up and survival can be defined as 'motivators for change' whilst step change and continuous improvement are more accurately described as 'types of change.' To rectify this situation it was decided to replace step change and continuous improvement on the grid by establish leadership and maintain leadership. These two terms will help to clarify understanding as they can, like survival and catch up, be described as motivators for change.

![Figure 35: Modified Grid used to define the type of improvement](image)

Establish leadership falls in the proactive/strong category on the grid and refers to an opportunity to introduce a new process or initiative, through a step change, that can have a radical effect on the organisation. As discovered during the secondary research...
and case study work, innovative breakthrough ideas, step change or improvement initiatives often become flavour of the month fads. The challenge is to sustain the activity and benefits after the initial burst of activity that is often followed by no action and eventual disappointment. Establish leadership is a distinct opportunity to steal a march on the competition.

Maintain Leadership is associated with proactive/weak forces for change. This does not mean that the weak forces are not important but at this stage, there is no evidence of the competition doing anything different and the external forces are having no measurable effect on the organisation. The paradox of this situation is that this is often the most appropriate time for the organisation to be able to introduce real, sustainable change. The problem is that because there is no observable pressure on the company, it is least likely to enforce change. This situation requires strong, sustained action by the management team through continuous improvement activities in order to maintain leadership over the competition.

Another stage that caused some confusion during the experiments was the development of the urgency mismatch using the graphs (Fig. 38). It was difficult to justify how the scale worked on the graph and it was concluded that the 'likely support for change' curve could be better represented by a straight line. Using the graphs will more clearly identify any mismatch between the urgency required for a particular change and the likely urgency/support that will be forthcoming based on the dominant culture within the organisation. An example of an updated graph is shown in the revised 'survival' graph, Figure 36, below. In this example the mismatch between the required urgency level and the likely support is highlighted for an apathetic culture in a 'survival situation. The changes to the four graphs shown in Figure 38 are illustrated in Figure 39.
Further consideration of the experiments and pilot study resulted in a number of minor changes that would help to improve the flow and logic of the model. A revised flow chart showing these developments is shown in Figure 37. This revised version of the model refers to the Tables and Figures which are used in the original management guide sheets (Appendix 7). It is proposed that an updated version of the management guide sheets will eventually need to be produced where Tables 41 and 44 could be replaced by Tables 47 and 48 respectively. It is also suggested that Table 47 could be further refined and possibly replaced by Figure 40 which attempts to reduce the confusion when selecting improvement initiatives by linking the diagram more closely to Figure 3. These improvements need to be further tested and verified before fully incorporating them into the management guide sheets.
Need to do 'Something'

Awakening

- Cost reduction
- Flexibility
- Speed
- Reduce waste
- E commerce

Identify the 'whats'. Use box 'C' above as a guide.

Outcome - Key statement of 'whys'

Path 1

Outcome - A list of key objectives

Develop top-level performance measures, which align with the key objectives. Table 42 (Appendix 7)

Path 2

Proactive or Reactive?

Strong or weak forces?

Nature of Change defined

Figure 37: Revised model flow chart
Proactive

ESTABLISH LEADERSHIP

MAINTAIN LEADERSHIP

Reactive

SURVIVAL

CATCH UP

Strong

Weak

Type of Improvement defined. Feed into the process below

Survival

Establish Leadership

Catch Up

Maintain Leadership

Level of support required

HIGH

MEDIUM / HIGH

MEDIUM / LOW

LOW

Step Change

Continuous Improvement

Record level of support required

H

Undertake culture analysis. Use Table 43 (Appendix 7)
Company Culture

Identify the 'hows'
What tools and techniques will help us to achieve the 'whats'?
(See Table 41 – Appendix 7)

Summary:
List objectives and performance measures and possible initiatives

Record culture, degree of urgency & type of improvement required

Using Figure 38 (Appendix 7) match culture with change requirement, degree of support and level of support required

Using Table 44 (Appendix 7) determine summary of requirements and actions.

Decide appropriate improvement process to be used at this stage

Summarise outcomes of Path 1 and Path 2.

Check 'success potential' score using IMP, Table 45 (Appendix 7)

PUT PLAN INTO ACTION

Figure 37: Revised model flow chart
The experiments were a means of testing the model's logic and flow. However, the main business objective of using the model is to develop a logical and appropriate way forward for the organisation concerned and this is discussed in the next few paragraphs.

The outcomes from the 'pilot study' suggested a top down, management team driven approach. The model indicated that culture change was required within the organisation and that there was a need to work on management commitment. The fact that the company failed to pursue the initiative, as described in section 6.3.1, was further evidence of the apathy that existed throughout the organisation and gives credibility to the outcomes from the model.

Therm's statement of whys was 'an opportunity to use new tools and techniques to improve the business and manage the potential growth opportunity' and the outcome from the model suggested that forced change, driven by the management team was the most appropriate method for the change initiative and also that major culture change was required. However, the actual approach used was to train and educate the management team and to introduce individual projects and improvement activities in specific, identified areas. This was an attempt by the Senior Management team to change the culture of the management team and then work with them to drive specific improvements through the organisation. Thus culture change was a significant outcome from the model and the need to train and support the management team (initially through training) then work together to drive improvements was a viable and realistic way forward for the organisation.

Brecon Pharmaceuticals developed four key objectives and the outcome of the experiment was to carry out a management driven pilot exercise in one area in order to produce improvements in line with the objectives and also to work on developing the organisation's culture. However, application of the IMP provided further food for thought and strong support that the performance measures identified needed to be introduced and used. Thus the way forward was to develop and apply the performance measures
in a pilot area and to introduce improvements in line with the performance measures and key objectives using the tools and techniques identified during the application of the model.

In Panasonic, the statement of whys was 'growth and customer pressure to improve the overall performance of the Service Centre' and the options developed were a bottom up approach using 5S and driven by the Team Leader and Administrator and a top down process mapping exercise to identify opportunities to drive waste out of the business processes. Again application of the IMP showed the benefits of developing and introducing appropriate performance measures and this was a major influence on the eventual way forward.

It was interesting that the actual way forward taken by Therm and Panasonic, and to a lesser degree Brecon Pharmaceuticals, was strongly influenced by the IMP score. The need to develop and use relevant and appropriate measures became a main requirement for Panasonic and the application of the IMP in Therm resulted in them suspending their current improvement initiative and moving forward through training and development as described above.

The pilot study and the three experiments provided confidence that the IMP is a worthwhile and necessary tool that needs to be applied as part of the model application. It also confirmed the importance of working through the model in a structured and logical way in order to develop information that can be fed into the IMP to provide a percentage success rating score. This process helps to develop a sustainable approach, especially when the performance measures become embedded within the organisation and are used as a means for monitoring and driving improvement.

As stated earlier the experiments were successful in testing and validating the model's logic and flow and the outcomes were both realistic and meaningful. Also a number of
opportunities for refining and improving the model were identified and these will be discussed in the next section.

6.6 Further Work
The experiments proved that the model could produce meaningful outcomes. However, a number of opportunities for further improvements were raised. The process works by guiding and facilitating a management team through the model. In order to use the model it will be useful to develop guidance notes to assist the facilitator. These guidance notes would be developed to help a facilitator use the model. A secondary support would be to provide further information and examples of the use of the initiatives and performance measures presented in the model. It would then be necessary to test the model using a facilitator from the management team in order to evaluate the effectiveness of the guidance notes and the process without the intervention and support of the researcher.

The use and usefulness of the new urgency/degree of support graphs need further testing and refinement. It is possible that the graphs could be replaced by a matrix or a decision tree but this area needs further research and ultimately further testing.

The use and usefulness of the IMP was described earlier in the conclusions to the experiments. As stated the percentage potential success rating developed from the initial version of the IMP created further debate about how to move the business forward. Further testing of the IMP to verify and possibly refine the scoring system is required to provide further credibility and validity to the results obtained.

The use of the IMP to review progress showed that there were difficulties when using the 'ongoing' version of the IMP. This may have been due to the situation at Panasonic where the performance measurements were in an early stage of development and it was difficult to measure business progress against each of the performance indicators. For this reason the 'initial' version of the IMP was used, successfully, as an ongoing
measure of progress. It is suggested that the 'ongoing' version of the IMP cannot be used until the performance measures are in place and producing useful data. Thus there needs to be a crossover point where the 'initial' version of the IMP is replaced by the 'further' version. This again is an area that needs to be tested further in a live experiment.

Further testing and proving of the culture questionnaire could be undertaken in relation to the scoring system and how accurately it relates to the four cultures described. It has been strongly emphasised, however, that the questionnaire was developed for use as a guide only and not as a definitive measurement tool. It was comforting that the scores accumulated from applying the culture questionnaire during the experiments were described as providing a good match to the prevailing culture within the organisation. This provides a degree of confidence that the culture questionnaire is relevant and appropriate. However, in order to gain further confidence regarding the reliability of the questionnaire it may be necessary to test the process on further applications. This will help to develop and further validate the scoring system and give further credibility to the results obtained.

6.7 Summary

This chapter discussed the development and testing of a sustainable improvement model. The chapter described how the model was developed and the model has been tested and proven to work - within the limits of the applications undertaken. The model considers a broad range of implementation issues that were identified and regarded as necessary from the research undertaken. Following the applications of the model, opportunities for further work and refinement of the model have been identified and discussed. The development of the model tends to suggest that the main research aim has been achieved. Conclusions relating to the research aim and the research questions are discussed in Chapter 7.
Chapter 7
CHAPTER 7: DISCUSSION AND CONCLUSIONS

7.1 Introduction

This research has focused on improvement and change within manufacturing organisations and the service department of one manufacturing company, Panasonic. Three research questions and a research aim were developed and tested. This final chapter discusses the research and draws a number of general and specific conclusions relating to each of the research questions posed. Section 7.2 discusses the research questions and the conclusions reached.

The research investigated improvement initiatives that, after the initial excitement, are often abandoned for a new bigger, better, state of the art opportunity. This endless (and sometimes mindless) chasing of the next improvement initiative and the reasons for failure, success and sustainability were investigated and discussed. The research was primarily concerned with the process used to successfully introduce and sustain performance improvement. It identified the need for a balanced approach integrated into the development of a strategy for performance improvement that incorporates both implementation and sustainability.

The research identified organisations that introduced initiatives but failed to measure progress and evaluate whether they were succeeding or not. The lack of clear objectives at the beginning was recognised as a contributory factor to this. It is difficult, if not impossible, to develop a monitoring process for a performance improvement programme if clearly defined objectives have not been developed. Clear, well-communicated objectives ensure that people know where they are going and will, therefore, have a better chance of getting there and of knowing if they've finally arrived. The development and use of appropriate performance measures helps to encourage actions congruent with the company's business strategy and to monitor progress of the improvement programme.
The general confusion in selecting an appropriate improvement initiative and how it relates to other initiatives was recognised. The lack of a good, agreed taxonomy of improvement initiatives was identified as one reason for this confusion. Figure 3 was developed to reduce this confusion by placing initiatives in a taxonomic structure which clearly illustrates how improvement initiatives relate to each other.

When the literature provides guidance for implementation of performance improvement initiatives it is usually presented as a single, suit all companies, specific application. Little consideration is taken of an individual company's culture and responsiveness or openness to change and the type of change required. This research has examined the concept of a fixed implementation process for all and investigated its usefulness in the real world where organisations differ and depend on a multitude of complex and often seemingly unrelated factors. The model was developed to overcome this 'one solution for all' and provide a guide to the main factors and issues that need to be addressed when introducing performance improvement. In order to develop the model a thorough literature search was undertaken together with primary case study research and a survey. The model was developed, piloted and then tested through the use of three experiments. Applying the model forces the management team to make decisions on a number of identified factors in order to develop a strategy for implementation and sustainability that will be specific to the organisation concerned. This approach to implementation can be described as a contingent approach to the introduction of improvement initiatives. The idea of contingency emerged from the realisation that there was no universal best way of managing an organisation but rather a best way of managing in a particular context and that organisations are most effective when they are designed or aligned to their chosen environments.

The research aim and three research questions were developed, together with appropriate methodologies to test each research question. The testing of each research question through applying the relevant methodology was undertaken over three phases as follows:
Chapter 4 - Phase 1:
The Survey Questionnaire, (Research Question 1)

Chapter 5 - Phase 2:
The Case Studies, (Research Questions 2 & 3)

Chapter 6 - Phase 3: The Model
Development of a generic model. (Research Aim)
Testing of the model through a pilot experiment. (Research Aim)
Testing of the model through three experiments (Research Aim)

A number of important conclusions were drawn from each phase and these are discussed further in Section 7.2.

7.2 Conclusions Regarding Each Research Question

Three research questions have been developed and tested in this research. This section will discuss many of the arguments and conclusions reached.

Research Question 1 was investigated through the survey of automotive suppliers. As indicated earlier the response rate of 49% was very positive for a survey of this nature compared with an acceptable rate of 20% indicated by Denscombe (1998). An appropriate level of employee responded to the questionnaire which provided a degree of confidence in respect of the accuracy and reliability of the results. The pie chart (Figure 17) provides detailed information of the roles of the respondents.

Eighteen initiatives were listed on the questionnaire; of these over 72% were attempted per company. Fifteen companies (39%) attempted 16 or more initiatives; only eight companies (20%) attempted 9 or less initiatives. The average number of initiatives attempted per company was 13 (12.97), with a range of 4 to 18 initiatives. This relatively high number of initiatives attempted tends to suggest that there is a need for a
structured process that will encourage selection of an appropriate initiative or initiatives based on the needs and objectives of the organisation. The main conclusions from the findings were:

- A lack of understanding of the commitment required
- A lack of understanding of the long-term nature of these initiatives and the desired outcomes
- Initiatives being 'forced' through the supply chain by the major car manufacturers
- No strategic approach to the introduction of these initiatives, initiatives introduced as flavour of the month
- A general lack of understanding of how to implement the initiatives

It was also noted from the development of the survey with the group of manufacturing managers that there was a lack of understanding of how initiatives related to each other and their core purpose. The development of the taxonomic structure discussed earlier will help to reduce this lack of understanding.

FMEA, Kaizen, Lean Manufacturing & Statistical Process Control (SPC) were recorded as the most popular initiatives and with the exception of SPC these were included amongst the top four most successful initiatives.

At the opposite end of the popularity scale, Theory of Constraints, Business Process Re-Engineering (BPR), Taguchi and Supplier Integration were the least popular initiatives. Theory of Constraints and BPR were ranked as two of the four least successful initiatives.

The data collected and the conclusions reached from the survey tends to provide positive support for Research Question 1.

The conclusion drawn from the case studies was that unless a number of basic parameters were in place the likelihood of success was reduced. From the research in
Chapter 5 a number of common reasons for the success (2a) and failure (2b) of an initiative were identified.

- Performance measures were identified and used to monitor and control progress of the initiative
- Resources were made available including training and support structures
- Management commitment was demonstrated by providing resources and a structure to drive the initiative forward
- Shop floor employees were involved and empowered to act if the need arose
- The approach was planned by the management team and appeared to be ‘fit for purpose’.
- Lack of suitable performance measures and monitoring
- No plan, structure or strategy to take the initiative forward
- No commitment from top management
- The lack of commitment was demonstrated by the failure of management to support the project co-ordinator (Lean) and the manufacturing site (OCD)
- The project manager or change agent was of low status in the organisation
- The benefits were not sold to the management team
- There was a lack of understanding of the potential benefits and of the initiative itself from the management team

The common factors that improved the chances of success (2c) were also identified:

- Planned, structured approach introduced and driven by the management team
- Management commitment and involvement
- Clear, well defined objectives
- Performance measures developed and aligned with the objectives and used. A set of benchmark measures were taken and recorded at the beginning of the project
- Management structure in place to support the initiative
- Clear, specific company goals
The factors determining sustainability (2d) were identified, as:

- Performance measures were identified and used on an ongoing basis
- An investment in training was made as and when required
- There was evidence of a cultural change towards a more innovative, improvement based culture and a coaching, facilitator management style
- There was a significant financial investment and an investment in time and people
- Enthusiasm was created and sustained in a core group of employees
- People were empowered through ownership, training and tasks
- The initiative changed the way business was done, it became difficult to go back

It was noted that the reasons and factors for success were also essential to ensure sustainability as no initiative that was unsuccessful was sustained. Research Question 2 has been thoroughly investigated and factors and reasons for each of the stages were identified and used in the development of the model.

Research Question 3 asks whether management are taking a strategic approach to the introduction of improvement initiatives and planning the process of implementation. This question was investigated through the case studies and the literature review. The data gathered from the Welsh automotive suppliers in Chapter 4 also produced useful information that contributed to investigating Research Question 3. The data in Chapter 4 suggested that a strategic approach was not being taken by organisations when introducing performance improvement initiatives.

The case studies indicated that successful improvement initiatives were driven by the management team and in some instances a strategic improvement process was developed. Quotes and extracts from the case studies for successful initiatives are reproduced below to illustrate this point.

- There was strong evidence of top down commitment and involvement
- The TPM project was introduced in a structured way
The initiative was introduced and driven by the management team. It was a top down driven initiative with a structured upward involvement.

The process used to introduce the initiative was planned and developed by the management team.

The initiative was top down driven in order to set up and commit resources.

In contrast, less successful initiatives tended to have a lower degree of management commitment and support. Again typical quotes and extracts from the case studies illustrate this.

- There needs to be education of the management team.
- There was no clear owner of the initiative, manufacturing tried to drive it upwards which proved extremely difficult. . . . . . the initiative failed.
- Corporate behaviour indicated that they did not trust, or expect the initiative to succeed and they were reluctant to change the way they conducted business.
- The initiative has to be sold to the management team at the outset.

The survey of automotive companies suggests that there is a general failure in the majority of companies researched to undertake a planned strategic approach to the introduction of performance improvement initiatives. The case studies provided evidence that in successful improvement initiatives there was a strong indication that management had taken a planned and even a strategic approach. In less successful initiatives it was evident that a planned and strategic approach had not been taken.

The conclusion from the investigation into Research Question 3 was that success depends on a planned, strategic approach to the introduction of performance improvement initiatives that needs to be developed by the management team.

The next stage was to develop a model that would provide a framework for the development of the strategic approach. Schonberger (1996) identified the need for a guide path for organisations to follow when implementing or initiating change initiatives. This idea of a guide path fits neatly with the overall aim of this research i.e. developing a model for sustainability. The case studies provided strong support that a model could be
developed but further secondary research was undertaken to investigate some of the requirements and to establish the frameworks that were available. This research found that existing models were incomplete and failed to adequately take account of the requirements for both success and sustainability.

A further concern identified by Collerette, Schneider, & Legris, (2001) is that there was no consistent theory or approach to change: a step-by-step approach was advocated by Abrahamson (2000); Hamel (1997) proposes revolutionary step change; a third calls for caution in the face of change viewed as a fashion (Peter Brabeck, CEO Nestle) and Christenson (1997) warns against any change that goes beyond the company's absorption capacity. The argument proposed in this research is that all the approaches are relevant and appropriate, but not to every company at all times.

A number of weaknesses when organisations introduce performance improvement were identified and the need for a more complete approach that:

- supports both sustainability and implementation of performance improvement
- embraces levels 1, 2 and 3 of Figure 1
- considers the organisational setting, including culture
- selects appropriate and relevant improvement initiatives based on the taxonomy developed in Figure 3 and
- fills the gap between strategy and operational change.

The model was developed using the outcomes of the literature search from Chapter 2 and the case studies. Chapter 6 described the development and testing of the model. The model builds on the work of Kotter (1996), Strebel (2000) and his proactive/reactive and strong/weak forces of change; a number of authors (Kaplan and Norton, 1992; Hronec, 1993; Maskell, 1992; Zairi, 1994) in respect of performance measures and the work of a number of authorities (Handy, 1983; Burnes, 2004; Schein, 1985, 1995, 1996; Senge, 1990, 1999; Burns and Stalker, 1994; Ansoff, 1988) in relationship to strategy and structure and Fritz's (1999) path of least resistance.
The model was piloted, using a real situation, with some input from an Operations Manager. This pilot study helped to provide confidence in the flow of the model and its stages and logic. To test the model fully three experiments were carried out at Brecon Pharmaceuticals, Therm Tempered Limited and Panasonic Computer Products Europe Service Centre. The experiments are fully described in Chapter 6 together with further discussions and conclusions. The main points to emerge were:

- the process (model) has a logical order
- the model was found to be difficult to use without a trained and knowledgeable facilitator
- the performance measures need more explanation and clarification
- the performance measures and their application was difficult to understand
- the development of objectives would benefit from further guidance
- the IMP was a useful benchmark regarding the likelihood of success of an improvement programme
- The range of initiatives listed would be more useful if they had examples or case studies of how they worked and where / when they worked
- Development of the hows was difficult
- Using the graphs to match culture to degree of urgency caused some confusion
- the culture questionnaire was excellent and provided a different perspective on change
- The outcomes from the model were relevant and appropriate to the organisations tested

Section 6.5 describes the results of the experiments and makes recommendations to improve the model. A revised model was developed which incorporated a number of modifications and Figure 37 shows a revised model flow chart.

Further information and conclusions relating to the experiments have been described in Chapter 6. The conclusion to be drawn from the case studies and the experiments was that the research aim has been achieved. A generic model has been developed that
has a number of identified, common, factors which when applied to a manufacturing enterprise will enable the organisation to successfully develop a strategy for performance improvement and help to integrate the improvement initiatives into the company's systems and processes. Table 40 shows the link between the primary research and the research questions and provides a summary of the research process.

Table 40: Summary of Research Process

<table>
<thead>
<tr>
<th>Area</th>
<th>Primary Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Aim</td>
<td>Case Studies, Survey</td>
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<tr>
<td>Research Question 1</td>
<td>Survey of Automotive Companies</td>
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<tr>
<td>Research Question 2</td>
<td>Case Studies</td>
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<tr>
<td>Research Question 3</td>
<td>Case Studies</td>
</tr>
<tr>
<td>Development and Testing of the Model</td>
<td>Gedunken (Pilot) experiment Three experiments in three organisations</td>
</tr>
</tbody>
</table>

7.3 Limitations

As with all research there are limitations related to the practical and theoretical research undertaken. One requirement is to identify, understand and reflect on these limitations to ensure that the research is not taken out of context and to identify areas for further work. The survey of automotive companies, although well responded to and embracing 49% of the companies identified is, nevertheless, limited to Wales. Is Wales typical of the U.K.? One comforting factor is that the study by Sheffield University (Waterson et al, 1997) showed a similar pattern of activity in respect of initiatives undertaken within English manufacturing companies.

The case studies were based on three separate organisations with different cultures and experiences of implementing improvement initiatives. The criteria used to select the case companies are listed and explained in more detail in Section 5.4.1. The three
companies selected were Robert Bosch, Tenneco and Ortho Clinical Diagnostics. Six case studies in three organisations may be regarded as insignificant when compared with the total number of manufacturing companies in the UK. However, it is appropriate to comment that these can be regarded as a very good representation of manufacturing organisations and the six case studies are typical of implementation initiatives undertaken. The outcomes from the case studies are supported by the literature search and this adds further credence and validity to the outcomes and conclusions drawn in previous chapters. These conclusions together with the information gathered through the literature search has provided sufficient evidence and information to enable a sustainable improvement model to be developed.

The model was piloted and then tested through three experiments. The limitations of the pilot exercise and the three further experiments were discussed in Chapter 6. It was concluded that the experiments were successful in that they tested and proved the workability and functionality of the model, raised a number of issues and identified opportunities for improvement and further work.

The research undertaken and the subsequent development of the model were specific to the manufacturing industry. No primary research was carried out in the service sector as such even though one of the experiments was conducted in the Service Department of a manufacturing organisation - Panasonic. All of the companies included in the initial survey were discrete part suppliers to the automotive industry. The case studies consisted of six case studies in three organisations, two of which were discrete parts, automotive suppliers whilst the third was a discrete products supplier to the pharmaceutical industry. The three experiments were carried out at Brecon Pharmaceuticals - a pharmaceutical packaging company, Therm Tempered Limited - a double glazing manufacturer and the service provision of Panasonic Computer Products Europe - a manufacturer of laptops.
7.4 Further Work

This research introduced a number of concepts and also developed a model that supports the introduction and sustainability of an improvement programme. The three experiments proved the validity of the model and its logic and flow and produced meaningful outcomes for the organisations concerned. A number of opportunities for developing the model further were identified and these are discussed in section 6.6. One area of further work would be to carry out longer term experiments in specific organisations using internal company-based facilitators and with the improvements and second version of the model in place.

Testing the model provided support for the use of the culture questionnaire and a degree of confidence regarding its accuracy and validity. Further understanding and development of cultural issues and their impact on improvement activities would be useful. Also further refinement of the cultural analysis process will help to ensure a more accurate starting point and a more focused approach to cultural development as part of the change process itself. The IMP needs to be used in a range of situations in order to test it and prove or justify the scoring system. The IMP could be trialled throughout a number of improvement initiatives in a selection of organisations and the initial score and ongoing scores compared with the outcomes achieved within each of the organisations researched. This will again provide a greater pool of information and provide even greater justification and validity to respective scores.

Similarly researching the drivers related to how a transformation or improvement effort actually starts within an organisation would be useful – are they always a response to a crisis or competitive pressure? How can a management team that historically has no experience, concept or more importantly ‘will’ to improve actually realise the need for improvement and take action accordingly? Is it true that without a crisis to frighten the organisation into action then no action will take place and in the worst case the organisation could just slowly whither away and eventually die? How important is leadership within an organisation, is the concept of leadership over or under stated?
How can the mindset of Taylorism be eradicated from management thinking and action once and for all?

7.5 Summary of Conclusions

This chapter has summarised the research and discussed the outcomes in respect of each of the research questions and the research aim. Research should not only attempt to answer questions but should open the door for more questions. This research has responded to three specific research questions and satisfied the overall research aim by developing a model that can support sustainable improvement.

The model represents a significant contribution to knowledge in the areas of performance improvement and as a practical tool. This research examined the concept of a fixed implementation process for all and questioned its usefulness in the real world where organisations differ and depend on a multitude of complex and often seemingly unrelated factors. The research also identified limitations when organisations introduced performance improvement and the model was developed to encourage a more complete approach that:

- supports both sustainability and implementation of performance improvement
- embraces levels 1, 2 and 3 of Figure 1
- considers the organisational setting, including culture
- selects appropriate and relevant improvement initiatives based on the taxonomy developed in Figure 3 and
- fills the gap between strategy and operational change.

The model was developed to overcome the limitations of the 'one solution for all' approach by identifying and providing a number of key factors and a series of stages that must be addressed when introducing performance improvement. Applying the model requires the management team to reach agreement at identified stages on the specific factors that apply to their organisation in order to develop a strategy for implementation and sustainability that will be unique to their organisation. This can be described as a contingent approach to the introduction of improvement initiatives.
A further innovation was the development of the Initiative Measurement Process. The IMP provides a reality check to the implementation and sustainability of a performance improvement. It will quantify whether the outcomes of the model, measured against a number of variables are likely to result in a successful and sustainable improvement and can also help to focus effort at the implementation stage. The IMP can also be applied at agreed time intervals to measure progress and maintain focus for the initiative and be used as an ongoing measure of progress - a monitoring tool for the initiative itself.

The research recognised the confusion and difficulty in selecting an appropriate improvement initiative for an organisation and how initiatives relate to each other. It was suggested that a possible reason for this was the lack of a good, agreed taxonomy for this type of change. Figure 3 was developed to reduce this confusion and simplify the selection of an improvement initiative by placing them in a taxonomic structure which illustrates where they 'fit' in the improvement process and how they relate to each other.

The research also raised a number of issues and opportunities for further work and these are fully described in Section 6.6 and also briefly in Section 7.4.

The model for sustainable improvement was developed after taking into account the results of the case studies and the literature search. The model is functional; it will produce a result or way forward for an organisation when the stages are worked through in the logical sequence recommended and management commitment is obtained at each stage.

If the success of a research project can be determined by how successfully it responds to the research questions, whether or not it achieves the research aim and whether it develops opportunities for further research then it is prudent to conclude that this research has been successful. The research has certainly changed the thinking and beliefs of the researcher. Whether or not the research achieves the ultimate aim of changing the thinking or beliefs of the reader is for the readers themselves to decide.
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Appendices
List of Appendices

Appendix 1: Covering Letter Sent To Surveyed Companies
Appendix 2: Survey of Successful and Unsuccessful Improvement Initiatives
Appendix 3: Examples of Completed Survey Questionnaires
Appendix 4: Survey Results – Raw Data
Appendix 5: Structured Interview Questionnaire
Appendix 6: Example of a completed Structured Interview Questionnaire
Appendix 7: Model worksheets
Appendix 8: Background Data for Initiatives & Performance Measures
Appendix 9: Key Influences in the Development of the Model
Appendix 10: Experiment 1 – Further Information
Appendix 11: Experiment 2 – Further Information
Appendix 12: Experiment 3 – Further Information
Appendix 13: Nominal Group Techniques
Appendix 14: Brainstorming
Appendix 15: Examples of Potential Improvements
Appendix 1: Covering Letter sent to Surveyed Companies

23/07/99

Dear Sir or Madam

I am a mature student pursuing my PhD through the Open University on a part-time (evening) basis. I am currently researching the degree of success or failure of improvement initiatives in automotive components manufacturing companies in Wales. In order to progress this research please can you complete the enclosed survey and return it to me either by fax on 01443 230201 or in the enclosed S.A.E.

I will inform you of the results of the survey when I have analysed the information.

If you have any queries relating to the documentation or would like any further information related to the research topic then please ring me on 01443 230200.

Thank you for taking the time to complete this survey.

Yours faithfully

Alun Batley
Appendix 2
Appendix 2: Survey of Successful and Unsuccessful Improvement Initiatives

Company ___________________________ No. of Employees _______

Your Name & Job Title (optional) _______________________________________

Please indicate by ticking the appropriate box, your perception of the degree of success or failure of improvement initiatives that have been undertaken at your site. Use the scale indicated as follows:

5 highly successful, 4 successful, 3 neither a success nor a failure, 2 moderate failure, 1 total failure.

Also indicate whether the initiative is completed or ongoing. Any initiatives that you have undertaken that are not shown below can be added and graded accordingly.

<table>
<thead>
<tr>
<th>Improvement Initiative</th>
<th>Success</th>
<th>-</th>
<th>Failure</th>
<th>Completed</th>
<th>Ongoing</th>
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</thead>
<tbody>
<tr>
<td>Just-in-Time</td>
<td>5</td>
<td>4</td>
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<td>TQM</td>
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<td>Lean Manufacturing</td>
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<td>Statistical Process Control (SPC)</td>
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<td>Kaizen</td>
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<td>Business Process Re-engineering</td>
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<td>Total Productive Maintenance</td>
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<td>Taguchi – D.O.E.</td>
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<td>Failure Mode &amp; Effects Analysis</td>
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<td>Supplier Integration</td>
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<td>Quality Circles (or equivalent)</td>
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<tr>
<td>Theory of Constraints</td>
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</table>

Please return to Alun Batley, using the enclosed S.A.E. or by fax to 01443 230201. Please note that all information will be treated as confidential.

Thank you for your help.
Appendix 3
# Survey of Successful and Unsuccessful Improvement Initiatives

Company **AVENARD SPRINGS**  
No. of Employees **90**

Your Name & Job Title (optional) **PLANT DIRECTOR**

Please indicate by ticking the appropriate box, your perception of the degree of success or failure of improvement initiatives that have been undertaken at your site. Use the scale indicated as follows:  
5 highly successful, 4 successful, 3 neither a success nor a failure, 2 moderate failure, 1 total failure. 
Also indicate whether the initiative is completed or ongoing. Any initiatives that you have undertaken that are not shown below can be added and graded accordingly.

<table>
<thead>
<tr>
<th>Improvement Initiative</th>
<th>Success</th>
<th>Failure</th>
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Please return to Alun Batley, using the enclosed S.A.E. or by fax to 01443 230201.  
Please note that all information will be treated as confidential.  
Thank you for your help.
Survey of Successful and Unsuccessful Improvement Initiatives

Company: Braze Engineering  
No. of Employees: 105

Your Name & Job Title (optional): C. Kelly, Quality Manager

Please indicate by ticking the appropriate box, your perception of the degree of success or failure of improvement initiatives that have been undertaken at your site. Use the scale indicated as follows: 5 highly successful, 4 successful, 3 neither a success nor a failure, 2 moderate failure, 1 total failure. Also indicate whether the initiative is completed or ongoing. Any initiatives that you have undertaken that are not shown below can be added and graded accordingly.

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Thank you for your help.
Survey of Successful and Unsuccessful Improvement Initiatives

Company: [Senior Executive]  No. of Employees: 250

Your Name & Job Title (optional): [Your Name] (M.D.)

Please indicate by ticking the appropriate box, your perception of the degree of success or failure of improvement initiatives that have been undertaken at your site. Use the scale indicated as follows: 5 highly successful, 4 successful, 3 neither a success nor a failure, 2 moderate failure, 1 total failure. Also indicate whether the initiative is completed or ongoing. Any initiatives that you have undertaken that are not shown below can be added and graded accordingly.

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Thank you for your help.
Survey of Successful and Unsuccessful Improvement Initiatives

Company: Avonride
No. of Employees: 41

Your Name & Job Title (optional): A. Hadril. Director

Please indicate by ticking the appropriate box, your perception of the degree of success or failure of improvement initiatives that have been undertaken at your site. Use the scale indicated as follows:

- 5 highly successful
- 4 successful
- 3 neither a success nor a failure
- 2 moderate failure
- 1 total failure

Also indicate whether the initiative is completed or ongoing. Any initiatives that you have undertaken that are not shown below can be added and graded accordingly.

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Thank you for your help.
Appendix 4
## Summary of Results

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Summary of Results

Ranking of responses

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Summary of Results

Number of responses per initiative

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<tr>
<td>TQM</td>
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</tr>
<tr>
<td>Lean Manufacturing</td>
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</tr>
<tr>
<td>Kanban</td>
<td>30</td>
</tr>
<tr>
<td>SMED (Quick changeovers)</td>
<td>29</td>
</tr>
<tr>
<td>Poka-Yoke</td>
<td>27</td>
</tr>
<tr>
<td>Statistical Process Control (SPC)</td>
<td>32</td>
</tr>
<tr>
<td>Kaizen</td>
<td>34</td>
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<tr>
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<tr>
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</tr>
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<td>Benchmarking</td>
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<tr>
<td>Taguchi - D.O.E.</td>
<td>20</td>
</tr>
<tr>
<td>Failure Mode &amp; Effects Analysis</td>
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</tr>
<tr>
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<th>% Completed</th>
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<td>25</td>
<td>10.00%</td>
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<td>10.71%</td>
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<td>30.30%</td>
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<td>15.33%</td>
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<td>22.58%</td>
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<td>8</td>
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<td>25.00%</td>
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<td>22.22%</td>
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<td>19.44%</td>
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<td>12.00%</td>
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<td><strong>Totals</strong></td>
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<td>14.93%</td>
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Appendix 5
Appendix 5: Structured Interview questions

Organisation ____________________ Interviewee's Name__________________

The following questions have been developed to indicate the degree of success or failure of individual initiatives, which have been introduced into an organisation. A separate questionnaire will be completed for each initiative.

1. Please describe the particular initiative that has been introduced?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. When was the initiative launched or first introduced into the organisation?

________________________________________________________________________

3. Is the initiative complete (please state date of completion) or ongoing?

________________________________________________________________________

4. What were the main objectives behind the introduction of this particular initiative?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

5. What measures were used to monitor the initiative?

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<tr>
<th>Performance Measure</th>
<th>Unit</th>
<th>At launch</th>
<th>Current</th>
<th>Change</th>
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6. What investment was required to introduce and sustain the initiative?

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7. How well did the initiative achieve the following goals?

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<th>1</th>
<th>2</th>
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<th>4</th>
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<tbody>
<tr>
<td>Translate specific business objectives into concrete action</td>
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<tr>
<td>Align people towards a common objective</td>
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<tr>
<td>Produce measurable improvement/s – short term gains</td>
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<tr>
<td>Produce measurable improvement/s – long term gains</td>
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<td></td>
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<tr>
<td>Drive improvements in business processes</td>
<td></td>
<td></td>
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<tr>
<td>Enhance the organisation's ability to compete in the future</td>
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TOTAL

1 = no success
2 = some success
3 = reasonable success
4 = very successful

Please list and rank any further goals you used that are not listed above

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</tbody>
</table>

TOTAL

1 = no success
2 = some success
3 = reasonable success
4 = very successful
8. What other changes resulted due to this initiative? | 1 | 2 | 3 | 4 |
---|---|---|---|---|
Cultural changes – innovation, improvement based? |  |  |  |  |
People became empowered – not afraid to take risks |  |  |  |  |
Managers moved towards a coaching/facilitation style |  |  |  |  |
A broader range of performance measures were introduced |  |  |  |  |
Performance measures were re-aligned with the strategy |  |  |  |  |
The initiative changed the 'way we do business' |  |  |  |  |

TOTAL

1 = no change | 3 = quite noticeable change
2 = some change | 4 = significant change

Please list and rank any changes that resulted that are not listed above | 1 | 2 | 3 | 4 |
---|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

TOTAL

1 = no change | 3 = quite noticeable change
2 = some change | 4 = significant change

9. What process was used to introduce the initiative? (e.g. bottom up, top down etc.)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

10. What, if anything, would you do differently if you were introducing a similar initiative to your organisation or the same initiative to a different organisation?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Appendix 6
Initiative Measurement Process

Structured Interview questions

Organisation: Robet Bush         Interviewee's Name: Dave Bush

The following questions have been developed to indicate the degree of success or failure of individual initiatives, which have been introduced into an organisation. A separate questionnaire should be completed for each initiative.

1. Please describe the particular initiative that has been introduced?
   
   T. P. M.

2. When was the initiative launched or first introduced into the organisation?
   
   1996 - LOOKED AT - PILOT DECIDED
   1998 LAUNCHED - (SUCCESS OF PILOT)

3. Is the initiative complete (please state date of completion) or ongoing?
   
   ONGOING

4. What were the main objectives behind the introduction of this particular initiative?
   
   • UTILISATION OF EQUIPMENT TO INCREASE DEMAND
   • TO GET THE MILE RUNNING MORE EFFECTIVELY / RELIABLY

5. NEXT STEP LINK WITH LEAN INITIATIVE.

InitiativeMeasurementProcess.02.27/06/00
5. What measures were used to monitor the initiative?

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<th>Change</th>
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<td>76%</td>
<td>82%</td>
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<td>£/hr.</td>
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<td>£3.5m</td>
<td>£2.96m</td>
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<td>Safety - No. of Accidents</td>
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<td>25/100k</td>
<td>20</td>
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<td>Maintenance Hrs. Expected Against Achieved</td>
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<td>70%</td>
<td>85%</td>
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6. What investment was required to introduce and sustain the initiative?

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<th>Time</th>
<th>£</th>
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<td>Full</td>
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<tr>
<td>1x External Course</td>
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<td>2K</td>
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<tr>
<td>Awareness</td>
<td>1 Day Proc. 50 Workshops</td>
<td>500+</td>
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<tr>
<td>1x Full Time TPM Co-ordinator</td>
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<td>Full</td>
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7. How well did the initiative achieve the following goals?

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<th>4</th>
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<tr>
<td>Align people towards a common objective</td>
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<td>Produce measurable improvement/s – short term gains</td>
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<td>✓</td>
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<td>Produce measurable improvement/s – long term gains</td>
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<td>✓</td>
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<tr>
<td>Drive improvements in business processes</td>
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<td>✓</td>
<td></td>
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<tr>
<td>Enhance the organisation’s ability to compete in the future</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
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</table>

**TOTAL**

1 = no success

2 = some success

3 = reasonable success

4 = very successful

Please list and rank any further goals you used that are not listed above

<table>
<thead>
<tr>
<th>Goal</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPACT ON P.R.O.W.K FREE M.A.N.T.</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>IMPACT ON SAFETY</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>IMPACT ON Z KILOMETRES</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>IMPACT ON 5S</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>LINK BETWEEN TPM &amp; CENTRAL START.</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>T.P.M. IN THE OFFICE</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**

1 = no success

2 = some success

3 = reasonable success

4 = very successful

---

1999.

Earl 1999 May

96% people now of T.P.M.
8. What other changes resulted due to this initiative?

<table>
<thead>
<tr>
<th>Change</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural changes – innovation, improvement based?</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>People became empowered – not afraid to take risks</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Managers moved towards a coaching/facilitation style</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>A broader range of performance measures were introduced</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Performance measures were re-aligned with the strategy</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The initiative changed the ‘way we do business’</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL

1 = no change
2 = some change
3 = quite noticeable change
4 = significant change

Please list and rank any changes that resulted that are not listed above

<table>
<thead>
<tr>
<th>Change</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership of equipment by a team</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Morale improved</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>General skill levels at operator levels</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>More tasks taken on board by operators</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Technicians released for key jobs</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Reduction in amount of firefighting</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Reduction in breakdowns</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL

1 = no change
2 = some change
3 = quite noticeable change
4 = significant change
9. What process was used to introduce the initiative? (e.g. bottom up, top down etc.)

| Top Down Commitment & Involvement, Bottom Up Activity. |

| Role of C.P.T. Supporting TPM Co-ordinators Critical |

| C.P.T. Convener & Technical Experts Ran Workshops. |

10. What, if anything, would you do differently if you were introducing a similar initiative to your organisation or the same initiative to a different organisation?

| Ensure a budget is available up front (training of co-ordinators). Train co-ordinators in more depth over a 3 month period. Broad training on W.C. techniques for co-ordinators. Nominate t/leaders to be T.P.M. Champions, train them & look after them. |

| Yes | No |

11. In your opinion do you believe that the initiative was successful? [✓] [ ]

12. Any further comments

| Part-time Steering Committee - Sr. Managers |

| 5 people → Meet monthly initially now Re-instigating Cross functional management meeting/team. "Rest" of management 3 monthly |

| $4.9 secs. → 82% 19/2000 5-2 secs. → 74% 1998 |

X start small & build on success -(pilot to prove)! X need top management support & backing "you will do it" (Continual feedback of measures) Re-establishing control by setting up steering group.
Appendix 7
Appendix 7: Model Worksheets

Statement of whys – ideas and examples

- Strategy mismatch
- Customer pressure
- Competitive pressure
- Corporate pressure
- Internal pressure
- New ideas – opportunity
- Growth
- New knowledge
- New technique

Record key statement/s of why's below
Statement of whats – ideas and examples

- Reduce costs
- Increase flexibility
- Reduce waste (non value added)
- Increase speed
- Improve quality
- Improve supply chain
- Improve customer focus and alignment

Record key objectives below
Table 41: Identifying the Hows, Examples of Initiatives That Might Help

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Reduce Costs</th>
<th>Increase Flexibility</th>
<th>Reduce Waste</th>
<th>Increase Speed</th>
<th>Improve Quality</th>
<th>Supply Chain</th>
<th>Customer Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean Manufacturing</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Just-in-Time</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Business Process engineering</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Cellular manufacturing</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Total productive Maintenance</td>
<td>R</td>
<td>H</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>H</td>
<td>R</td>
</tr>
<tr>
<td>Supply chain management</td>
<td>R</td>
<td></td>
<td></td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>Design of Experiments</td>
<td>R</td>
<td></td>
<td></td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Kanban</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>H</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Theory of constraints</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>TQM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>Kaizen</td>
<td>H</td>
<td></td>
<td></td>
<td>H</td>
<td></td>
<td>R</td>
<td>H</td>
</tr>
<tr>
<td>Quick changeovers</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Concurrent engineering</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Benchmarking</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Poka yoke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>R</td>
<td></td>
<td></td>
<td>H</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>FMEA</td>
<td></td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>SPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R</td>
</tr>
</tbody>
</table>

Key: H – High, R - Relevant
Table 42: Identifying Performance Measures, some Examples and Possible Top Level Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reduce Costs</th>
<th>Increase Flexibility</th>
<th>Reduce Waste</th>
<th>Increase Speed</th>
<th>Improve Quality</th>
<th>Develop Supply Chain</th>
<th>Improve Customer Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>£s saved</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profit margin</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product R&amp;D costs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Process R&amp;D costs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Return on Assets</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OEE</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Capital Investment</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of quality</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Inventory turns</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Time to market</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P:D ratio</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% sales from new products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Customer complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>No. of process improvements</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer satisfaction index</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Customer PPM</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Supplier PPM</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'site' PPM</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manf lead time</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of new product intros</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>No of new model intros</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Summary to date

Statement of whys

Identification of whats – listed as key objectives

The hows – tools and techniques that will help to achieve the objectives

Key measures – balanced set of key performance measures

List summary below
Define the nature of change

Decide whether the change force is proactive or reactive

Guide
Reactive forces are ones, which are currently affecting the organisation
Proactive forces are not currently affecting the organisation

List decision below

Decide whether the change force is strong or weak

List decision below

Define the nature of the change strong / weak: reactive / proactive

Define the type of improvement using the grid

<table>
<thead>
<tr>
<th></th>
<th>STEP CHANGE</th>
<th>CONTINUOUS IMPROVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive</td>
<td>SURVIVAL</td>
<td>CATCH UP</td>
</tr>
</tbody>
</table>

State the type of improvement below. Now read the descriptions of the improvement types and decide if the analysis and the descriptions match. Record the discussed and agreed 'improvement type' at the end of the descriptions as indicated.

The type of improvement from analysis: ___________________________
**Step Change**
A step change is closely linked to breakthrough ideas and opportunities and usually refers to an opportunity to introduce a new process or initiative that can have a radical effect on the organisation. A step change within this definition is an opportunity which is not yet affecting the organisation, but is a distinct opportunity to steal a march on the competition.

**Survival**
The main difference from the previous scenario, innovation, is that the effects are already starting to hit the organisation. It is likely that if no action is taken then the competition will gain a significant competitive advantage, which at best will lead to a loss of business but at worst could lead to a loss of the business.

**Continuous Improvement**
Recognised in the grid by proactive/weak forces for change. This doesn't mean that the weak forces are not important but at this stage there is no evidence of the competition doing anything 'different' and the weak forces are having no measurable effect on the organisation.

The paradox of this situation is that this is the most appropriate situation for the organisation to be able to introduce real, sustainable change. The problem is that because there is no observable pressure on the company then it is the situation that is least likely to enforce change.

**Catch Up**
This is a situation in which there are weak/reactive forces for change acting on the organisation. If no action is taken at this stage then it is possible that the business will fall behind the competition and eventually drop into 'survival' mode. There is pressure on the management team to create a sense of urgency in order for the organisation to take appropriate action. This may be difficult if the consequences of not taking action are not immediately recognisable or seem insignificant to other problems that may exist in the organisation.
Following a discussion based on the descriptions above and the initial analysis state the type of improvement below:

Determine the degree of urgency – feed the type of improvement into the model

Degree of urgency required

<table>
<thead>
<tr>
<th>Survival</th>
<th>Step Change</th>
<th>Catch up</th>
<th>Continuous Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>MEDIUM / HIGH</td>
<td>MEDIUM / LOW</td>
<td>LOW</td>
</tr>
</tbody>
</table>

Record the degree of urgency below:
Undertake organisational culture analysis. Use descriptions of culture and Table 43 as a discussion point and decision making aid.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There is an emphasis on positive rewards for improvement activities.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>People given guidance and support by their managers when they are needed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>There a general feeling of warmth and good fellowship in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>People feel they are part of a worthwhile company.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>People feel they are valuable members of working teams.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>People are empowered to make decisions and take action.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>When things go wrong they are viewed as a learning opportunity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>People know what is going on in the organisation – they are well informed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>There are feedback mechanisms related to people’s performance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Performance measures are used for improvement.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Performance measures are visible to everyone.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Management are open about what is happening in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>There is an emphasis on bringing problems out into the open.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>There an emphasis on risk taking in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Problems are solved ‘at source’.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>People are happy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Attendance is generally above the average for the industry.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>There a history of innovation and improvement in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>The approach to work is generally flexible and informal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>When things go wrong the culprit is traced and suitably punished.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>There is a lot of bureaucracy and red tape in the organisation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Playing safe is more likely than risk taking?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Problems have to go to a manager for discussion and approval before attempting to solve them.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>There is a feeling of mistrust between management and the rest of the workforce</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 43: Culture Analysis Process
Score your answers as follows:

Questions 1 to 19 inclusive

Strongly agree: 6  
Agree: 4  
Disagree 2  
Strongly disagree: 0

Questions 20 to 24 inclusive

Strongly agree: 0  
Agree: 2  
Disagree 4  
Strongly disagree: 6

Culture 'guide' results

Supportive / open  116 - 144  
Neutral  76 - 116  
Apathetic  36 - 75  
Hostile  0 - 36

It is emphasised that these scores are provided purely as a guide. The process of discussion and arrival at each individual decision should also influence the final decision. Brief descriptions of each of the cultures are provided below.

Supportive/Open

This culture supports and embraces change. The organisation has a strong, successful record of continuous improvement and innovation. There is likely to be an open management style with effective communication processes and a positive supportive approach to change. People feel that they are part of the organisation and there is a high level of trust within the business.

Neutral

There is generally a positive approach to change within the organisation and the management team although it is unlikely that there is the same level of commitment and excitement that is evident in the supportive/open culture described above. The management team and the workforce will tend to be
supportive of change initiatives but need to be constantly supported and 'nudged' along. Change is not a natural activity for the majority of employees but there is an underlying positive potential for change, which currently remains largely untapped. It is possible that there is a lack of suitable techniques or sufficient knowledge within the organisation, which may act as a barrier to change within this culture.

Apathetic

This culture can be compared with a bureaucracy that has existed for many years in an extremely stable or predictable market. It can be extremely difficult to introduce change within an organisation with an apathetic culture as quite often the people believe that the business is too big to be affected by external forces and there is a lot of red tape within the organisation. This culture is slow to perceive the need for change and slow to change even if the need is seen. There is little if any emphasis on risk taking. Often the rewarding structure is based around stability and performance to standard rather than innovation and change.

Hostile

This relates to a culture that is outwardly against or 'hostile' to change. This could be because they are fed up with the concept of change as they have been subjected to miracle cure after miracle cure. Another reason could be that the organisation has suffered from change initiatives that may have resulted in significant job losses or some other negative outcome for the employees. There is also a lack of trust between the management team and the rest of the workforce.

After completing the culture grid and discussing the descriptions above describe below the dominant culture that exists in the organisation.
Summary of path 2 progress. Record below:

a) Degree of urgency required
b) Culture
c) Type of improvement required
Figure 38: Degree of Support and Urgency Graphs
Using Figure 38, match culture with the change requirement and degree of support and urgency required. Record the results of the analysis below.

Using Table 44 determine the most appropriate option for the change process – remember this is a guide not a fait accompli and management action is imperative.

Record comments and conclusions below.
### Table 44: Change Process Options Guide

<table>
<thead>
<tr>
<th>Options for change process</th>
<th>Survival</th>
<th>Step Change</th>
<th>Catch up</th>
<th>Improvement</th>
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<td></td>
<td>No</td>
<td>x</td>
<td>x Poss</td>
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Notes:
- X: Recommended
- xx: Very High
- xx: High
- med.: Medium
- Low: Low
Summarise the outcomes of paths 1 and 2 below.
Using IMP, Table 45, check the success potential scores.

Use the following guide when analysing your overall and individual area scores

Maximum possible score = 300

Do not add objectives or measures just to achieve a maximum 300 score. Adjust your maximum possible score to reflect the number of key measures and objectives being pursued. It is recommended that a minimum number of 5 objectives and measures are used.

Thus the maximum possible score with 7 key objectives and 6 performance measures would be 230. It is best to evaluate your score as a percentage of the maximum.

Use the scoring system to highlight potential problem areas and ensure appropriate focus on those areas or go back through the discussion process using the original model as a guide.

Record initial score. ______________  Percentage ______________

* Use IMP Table 46 for ongoing performance measurement.
**Table 45: Initiative Measurement Process – Initial Benchmark**

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<thead>
<tr>
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<tbody>
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<td>Key measures</td>
<td>Culture</td>
<td>Top down commitment</td>
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<tr>
<td>Number</td>
<td>B or F</td>
<td>Score</td>
<td>Number</td>
<td>A or G</td>
<td>Score</td>
</tr>
</tbody>
</table>

**Explanation**
- **Column 1:** Indicates the initiative being considered
- **Column 2:** Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score 100)
- **Column 3:** Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 100)
- **Column 4:** Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
- **Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
- **Column 6:** Total score

Maximum score possible 300 points
Table 46: Initiative Measurement Process – Ongoing process

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<td>Results</td>
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</table>

**Explanation**

Column 1: Indicates the initiative being considered
Column 2: % achievement of goals based on number achieved against those undertaken
Column 3: % success in respect of other changes
Column 4: Key objectives pursued. No. – number, B – Broad (2 points), F – Focused (10 points)
Column 5: Key measures used. No. – number, Results 0 – not successful (0 points), Y – results successful (10 points)
Column 6: Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
Column 7: Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
Column 8: Total score for each initiative
Finally summarise all the outcomes of the model and develop the final action plan.
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<th>Initiatives</th>
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<th>Increase Flexibility</th>
<th>Improve Quality</th>
<th>Increase Speed</th>
<th>Develop Infrastructure</th>
<th>Totals</th>
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<td>Sales forecast accuracy, Customer satisfaction index, On time delivery to customer</td>
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Appendix 9
### Appendix 9: Key Influences in the Development of the Model

<table>
<thead>
<tr>
<th>Model Stage / Activity</th>
<th>Key Influence</th>
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<td>Identifying the ‘whats’ the need for key objectives</td>
<td>Case Studies</td>
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<td>Improvement Definition Grid</td>
<td>Case Study Work&lt;br&gt;Strebel (2000)</td>
</tr>
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<td>Culture – Need to consider</td>
<td>Case Studies</td>
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<td>Ansoff (1988)</td>
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<td>Burns &amp; Stalker (1994)</td>
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</table>

| Culture Analysis and Change Process (Table 43) | Schein (1999) |
|                                             | Handy (1983) |
|                                             | Armstrong (1990) |
|                                             | Allen (1997) |

| Survival Curves (Figure 38) | Strebel (2000) |
|                            | Senge (1999) |
|                            | Handy (1983) |

| Table 44 Change Process Options Guide | Imai (1986) |
|                                        | Schonberger (1996) |
|                                        | Womack & Jones (1990, 1996) |
|                                        | Strebel (2000) |
|                                        | Gilgeous (1997) |

| Approaches to sustaining change | Ansoff (1988) |
|                                | Lewin (1951) |
|                                | Fritz (1999) |
|                                | Strebel (1994) |
|                                | Kotter (1996) |

| IMP Table 45 | Case studies |
|              | Maskell (1992) |
|              | Hronec (1992) |
|              | Zairi (1994) |
|              | Kaplan and Norton (1992) |
Appendix 10
Experiment 1: List of Appendices

Appendix 10A: Copy of presentation slides

Appendix 10B: Outcome of the model application

Appendix 10C: Details of IMP application for Brecon Pharmaceuticals
Sustainable Improvement
Alun Batley

Objective:
- To discuss Performance Improvement and how to sustain the benefits.

'All improvement is change but not all change is improvement'

Sustainable Improvement

Background...
Forty Automotive Suppliers in Wales responded to a survey regarding initiatives undertaken - (50% response)
The average number of initiatives attempted per organisation was recorded as......
Thirteen!!!!!
Some had finished TQM, Kaizen and JIT
Perception of success was variable!!!

Sustainable Improvement

Initiatives are introduced for the 'wrong' reasons
- Companies jump on the latest fad bandwagon
- If it's good enough for xyz then.....
- Corporate policy
- Government policy
- Customer pressure
- MD / Chief executive has been on a course or read a book or.....
- Seems a good idea
- Pressure to 'do something' - panic
- Etc.

Sustainable Improvement

Many improvement initiatives fail to deliver their 'supposed' benefits - They then wither away and die!!!

Why?
Sustainable Improvement

Initiatives start well but fade badly....

- Commitment and Ownership
- 'It's harder than we thought'
- MD / Chief Executive leaves – team changes
- Other priorities
- Resistance from the workforce....and management
- Initial excitement has worn off
- A new fad has appeared
- Corporate policy changes
- Etc.....

Sustainable Improvement

So What Can Be Done?

There needs to be a process for the introduction and sustainability of improvement initiatives.

This process must consider a number of key factors.

These key factors must be considered and agreed by the management team before the initiative or improvement activity is launched.

But surely that's obvious.....

Sustainable Improvement

Apparently not!

Further Research - Six Case Studies in three organisations

- Two successful - and ongoing
- One 'limping along'
- Three failures - dead

Initiatives failing and succeeding in the same organisation?

Sustainable Improvement

So what are the lessons learnt?

What are the key factors for success?

Sustainable Improvement

Other Factors for Success

- Training - specific and general
- Communication
- Ongoing monitoring and reviews
- Persistence and tenacity

And don't forget the people
Sustainable Improvement

Statement of whys
A clear statement of why the improvement is required – for example:
- Strategy mismatch
- Customer pressure
- New ideas, opportunity
- Growth
- Competitive pressure
Other?

Statement of hows
Statement or description related to how the objectives are likely to be achieved.

Define the nature of the change:
Strong or Weak
Reactive or Proactive

Develop appropriate performance measures
Aligned with the objectives
A balanced set of measures

Define type of improvement required
Proactive
Reactive
Strong
Weak

Then determine the degree of urgency required
Sustainable Improvement

Understand your culture

- Open/supportive
- Neutral
- Apathetic
- Hostile

Do this as a team!

Now consider the methods available

Sustainable Improvement

Typical methods

- Top down?
- Bottom up?
- Pilot & grow
- Management Team
- Cross functional team
- Empowering the people
- Facilitators etc.

Sustainable Improvement

Align the method with the culture and the degree of urgency required

- Understand the culture
- Use an appropriate method

AND START – TAKE ACTION

BUT – start with a plan!

Sustainable Improvement

Supporting processes for developing the plan

- Initiative Measurement Process (IMP)
- Implementation Model

These will help you to develop your plan - as a team and ensure you consider all the factors

Sustainable Improvement

The IMP will indicate your likelihood of success against a number of key factors....

- Key Objectives
- Key measures
- Culture
- Commitment

...and identify possible issues and opportunities

Sustainable Improvement

Then the hard bit....sustainability

- Monitor and maintain the process
- Support the people
- Make it part of the normal review process
- Agree changes if necessary
### Sustainable Improvement

**Again - supporting mechanisms or processes**

- Initiative Measurement Process
- Implementation Model

These will help you to evaluate your progress
- as a team
and consider progress against all the factors

---

### Sustainable Improvement

**Summary**

Many Improvement Initiatives fall to deliver their 'supposed' benefits

There are a number of key factors which will greatly improve the chances of short term and ongoing success

A model for improvement has been developed and successfully piloted - also the IMP will give an indication of the likelihood of success

---

### Sustainable Improvement

**Any questions?**

---

### Sustainable Improvement

**Thank You!!**

---

### Sustainable Improvement

**Alun Batley**
APPENDIX 10B: Outcome of the model application

Brecon Pharmaceuticals  Experiment 1

Statement of whys
Brecon Pharmaceuticals is going through a period of growth with a recent new development likely to create around 80 new jobs to add to the existing workforce of over 250. This latest development has been prompted by ongoing growth in demand for Brecon’s clinical trial supply and commercial packaging services and further supports the company’s declared mission of “Growth through Excellence”. Thus the main driver for improvement is growth and the statement of whys was agreed by the team to be:

‘Manage significant, planned growth’

Statement of whats – key objectives
• Increase the responsibilities and flexibility of the production operators
• Improve the speed of the order fulfilment process
• Identify and reduce waste in the order fulfilment process
• Reduce the number of quality checks whilst improving the levels of quality

Identifying the hows
Using Table 41 and the key objectives developed above the following ‘hows’ were developed as follows for Brecon Pharmaceuticals:

Flexibility
Quick changeovers and Kanban, Kanban to control the flow of materials and Quick Changeovers to reduce the changeover time from one job to the next.

Speed
Quick changeovers
Lean Manufacturing, order fulfilment process
5S – will help to find things easier and reduce search time
Identify and reduce waste
Lean Manufacturing, order fulfilment process
5S

Quality
Poka-Yoke, to develop preventative approach to problems
FMEA – to anticipate potential issues
Kaizen – to develop a structured, team based, problem solving approach to quality issues and problems
Performance Measures
Performance measures were developed to concur with the objectives set and to fit with the process at Brecon Pharmaceuticals.

- P:D ratio
- Manufacturing Lead Time
- Cost of Quality
- Inventory Turns
- No. of customer complaints
- Customer PPM
- Supplier PPM
- On site PPM
- IMP

Define the Nature of the Change
The change can be described as reactive as the forces for change are currently affecting the organisation. It was agreed by the team that the forces for change are strong. Surprisingly the outcome of the analysis was that the nature of the change can be described as 'survival'. This was surprising but when discussed with the management team it was agreed that if growth was not managed and introduced properly then it would definitely lead to a loss of business and over the long term this could result in the loss of the business itself if customer confidence was significantly damaged.

The degree of urgency required, as identified by the model is high, however, further discussions resulted in the management team agreeing that the degree of urgency was medium/high. This was due to the understanding that the growth will be managed over a two year period although it was agreed that because of the volume of work that needed to be undertaken then the urgency level should be rated as medium/high urgency.

Culture Analysis
Scores for organisation – 52, 52, 58 and 44

This indicates an apathetic culture and it was agreed through discussion that this was a VERY accurate description of the prevailing culture within the organisation. One of the key areas of agreement was the amount of bureaucracy and red tape within the company.
Summary of path 2 progress
Degree of urgency – medium/high
Culture – apathetic
Type of improvement required – Survival

Culture match with change requirement
From the graph there is a mismatch between the degree of likely support for the change and the degree of urgency required.

Most appropriate option for change initiative
Following clarification of the process and further discussion and debate, it was agreed that the most suitable process to use in order to ensure the improvement process satisfied the ‘urgency’ requirements and fitted the culture was to undertake a pilot study (top down) that would be tightly controlled, managed and driven by the management team. When the improvement started to show benefits it would be encouraged to grow outwards across the workforce. It was suggested that poka-yoke would be an appropriate initiative to use to start the improvement process.

Summary of outcomes from path 1 and path 2
Key objectives
Increase the responsibilities and flexibility of the production operators
Improve the speed of the order fulfilment process
Identify and reduce waste in the order fulfilment process
Reduce the number of quality checks whilst improving the levels of quality

Identifying the hows
Quick changeovers
Kanban
Lean Manufacturing, order fulfilment process
5S
Poka-Yoke
FMEA
Kaizen

Performance Measures
P:D ratio
Manufacturing Lead Time
Cost of Quality
Inventory Turns
No. of customer complaints
Customer PPM
Supplier PPM
On site PPM
IMP

Degree of urgency – medium/high

Culture – apathetic

Type of improvement required – Survival

IMP Initial analysis
Key objectives identified 4, 2 focused, 2 broad. = 24
Key measures identified 8 = 80
Culture, apathetic = 12
Top down commitment = 40
Note: maximum score attainable = 220

Score based on all Performance Measures being in place and used
154 - Chance of success = 70%

Score with no Performance Measures in place
74 - Chance of success = 34%

Recommendations:
Applying the model indicated that there is a need to work on the general culture of the organisation. A positive way of doing this is to undertake a management driven pilot exercise in one area to test the ideas and develop commitment within the management team and the workforce. There is a need to raise the urgency level and a pilot study may support this. The objectives are clear but could benefit from being more focused and specific. Also, it is important that the performance measures identified need to be introduced and used.
### Appendix 10C: Brecon Pharmaceuticals - Initiative Measurement Process – Initial Benchmark

<table>
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<td>Initiative</td>
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<td>Key measures</td>
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<td>Top down commitment</td>
<td>Score</td>
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<td>Score</td>
<td>Number</td>
<td>A or G</td>
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</table>

**Explanation**

- **Column 1:** Indicates the initiative being considered
- **Column 2:** Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score 40)
- **Column 3:** Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 80)
- **Column 4:** Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
- **Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
- **Column 6:** Total score

Maximum score possible 220 points

- % chance of success = 70% (Assuming all Performance Measures are in place and used)
- % chance of success = 34% (If none of the performance measures are in place and used)
Appendix 11
Experiment 2: List of Appendices

Appendix 11A: Application of the Model - Consensus Feedback

Appendix 11B: Application of the Model - Operations Director

Appendix 11C: Application of the Model - Managing Director / Financial Director

Appendix 11D: IMP Review - current live initiative

Appendix 11E: IMP Review - initial benchmark

Appendix 11F: IMP Review – Using training to develop skills, commitment and Culture change
APPENDIX 11A: Model Application - Team Consensus

Statement of whys

- Business Growth and business improvement
- New ideas – opportunity

'An opportunity to use new tools and techniques to improve the business and manage the potential growth opportunity'

Statement of whats – key objectives

- Reduce waste (non value added)
- Increase speed
- Improve quality
- Improve supply chain
- Reduce costs

Tools and Techniques

- Lean Manufacturing (costs, speed, quality, supply chain)
- 5S (Costs, waste, Quality)
- BPR (Costs, waste, speed, quality, supply chain)
- Poka-Yoke (quality)

Performance Measures and Targets

- Reduce customer complaints by 30%
- Reduce material usage, from 40% to 36%
- Delivery 100% with max variance of 2%
- IMP

The nature of change

The nature of the change is defined as:

- Proactive
The change force is:

- Strong

The type of improvement is identified as:

- Step Change

The degree of urgency is:

- Medium / High

Culture Analysis

- Therm generally – Apathetic/Hostile

Apathetic

It can be extremely difficult to introduce change within an organisation with an apathetic culture as quite often the people believe that the business is too big to be affected by external forces and there is a lot of red tape within the organisation. This culture is slow to perceive the need for change and slow to change even if the need is seen. There is little if any emphasis on risk taking. Often the rewarding structure is based around stability and performance to standard rather than innovation and change.

Hostile

This relates to a culture that is outwardly against or 'hostile' to change. This could be because they are fed up with the concept of change as they have been subjected to miracle cure after miracle cure. Another reason could be that the organisation has suffered from change initiatives that may have resulted in significant job losses or some other negative outcome for the employees. There is also a lack of trust between the management team and the rest of the workforce.

Match culture with the change requirement and degree of support and urgency required. Record the results of the analysis below.
There is a significant gap between the urgency required and the urgency being portrayed at present. There is low, if not negligible, commitment to the project by the middle management team, at present.

The most appropriate option identified for the change initiative

It was agreed that 'forced change, driven by the management team’ was the most appropriate option from the model.

IMP Scores

Potential % success rating for the current, live initiative - 23%

Potential % success rating for ‘forced change, driven by the management team’ - 57%.

Potential % success rating without training - 57%

Potential % success rating after training - 84%

Other potential options discussed:

- Use the senior management team, more focused, measurable approach
- Communication to the shop floor people
- Process changes to engage the shop floor...audited procedures
- Process changes to focus on key measures and results for individual managers and team leaders...audited
- Education and training of managers then drive improvement through the management team and specific projects
- Continue with B3 as a pilot
- Create change agents / champions

Agreed way forward

'To develop sustainable improvement start with education and training of the management team and then drive improvement through them.’
APPENDIX 11B: Model Application - Operations Director

Key statement of whys

- Strategy mismatch
- Customer pressure
- Competitive pressure
- Growth

Key objectives

- Reduce costs
- Increase flexibility
- Reduce waste (non value added)
- Increase speed
- Improve quality
- Improve supply chain
- Improve customer focus and alignment

Tools and Techniques

- Lean Manufacturing
- JIT
- 5S
- BPR
- Poka-Yoke

Performance Measures and Targets

- Reduce customer complaints by 30%
- Reduce material usage, from 40% to 36%
- Delivery 100% with max variance of 2%

Comments

Initial approach is to use 5S as a foundation tool to establish a baseline for further improvements. Drive through B3 on a pilot basis.
The nature of change

The nature of the change is defined as:

- Proactive

The change force is:

- Strong

The type of improvement is identified as:

- Step Change

The degree of urgency is:

- Medium / High

Culture Analysis

- Therm generally – Apathetic

Apathetic

It can be extremely difficult to introduce change within an organisation with an apathetic culture as quite often the people believe that the business is too big to be affected by external forces and there is a lot of red tape within the organisation. This culture is slow to perceive the need for change and slow to change even if the need is seen. There is little if any emphasis on risk taking. Often the rewarding structure is based around stability and performance to standard rather than innovation and change.

Match culture with the change requirement and degree of support and urgency required. Record the results of the analysis below.

- There is a significant gap between the urgency required and the urgency being portrayed at present. There is low, if not negligible, commitment to the project by the management team, at present.
The most appropriate option for the change process — comments and conclusions.

Initial process:
- Top down forced change using the management team to develop a pilot study within B3 – tough and singles area.

From evaluation of chart, options:

1. Drive change using the management team
2. A pilot study in a controlled area
3. Forced change, including changing the management team

Option 1 is difficult due to the apathetic approach of the management team.

Option 2, a pilot study in a controlled area (B3), is still a realistic option BUT there would need to be a dedicated team of people who would introduce the changes and ensure that management enforce them. A short sharp hit.

Option 3 is a realistic option and would again follow from a short sharp hit of a pilot area, but using a mix of people, the management team (new) and change agents.
APPENDIX 11C: Model Application - Financial Director & Managing Director

Key statement of whys

- New ideas – opportunity
- Growth
- Business Improvement

Key objectives

- Reduce costs
- Reduce waste (non value added)
- Reduce breakdowns
- Improve quality
- Improve customer focus and alignment

Tools and Techniques

- Lean Manufacturing
- JIT
- 5S
- BPR
- Poka-Yoke

Performance Measures and Targets

- Reduce customer complaints by 30%
- Reduce material usage, from 40% to 36%
- Delivery 100% with max variance of 2%

Comments

Approach is to use 5S as a foundation tool to establish a baseline for further improvements. Drive through B3 on a pilot basis.
The nature of change

The nature of the change is defined as:

- Proactive

The change force is:

- Weak

The type of improvement is identified as:

- Continuous Improvement

The degree of urgency is:

- Medium / Low

Culture Analysis

- Therm generally – Apathetic
- Therm Management team – Apathetic/Hostile

Apathetic

It can be extremely difficult to introduce change within an organisation with an apathetic culture as quite often the people believe that the business is too big to be affected by external forces and there is a lot of red tape within the organisation. This culture is slow to perceive the need for change and slow to change even if the need is seen. There is little if any emphasis on risk taking. Often the rewarding structure is based around stability and performance to standard rather than innovation and change.

Hostile

This relates to a culture that is outwardly against or ‘hostile’ to change. This could be because they are fed up with the concept of change as they have been subjected to miracle cure after miracle cure. Another reason could be that the organisation has suffered from change initiatives that may have resulted in significant job losses or some other negative outcome for the employees. There is also a lack of trust between the management team and the rest of the workforce.
Match culture with the change requirement and degree of support and urgency required. Record the results of the analysis below.

- There is a gap between the urgency required and the urgency being portrayed at present. There is low, if not negligible, commitment to the project by the management team, at present.

The most appropriate option for the change process – comments and conclusions.

Initial process:
- Top down forced change using the management team to develop a pilot study within B3 – tough and singles area.

Further suggestions:
- Use management team, more focused, measurable approach
- Communication to the shop floor people
- Process changes to engage the shop floor...audited procedures
- Process changes to focus on key measures and results for individual managers and team leaders...audited
- Education and training of managers etc
- Continue with B3 as a pilot
- Create change agents / champions

Major culture change is required, starting with the management team
### Appendix 11D: Therm Tempered Limited - Review of current ‘live’ initiative against model outcomes

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Key objectives</th>
<th>Key measures</th>
<th>Culture</th>
<th>Management commitment</th>
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#### Explanation

**Column 1:** Indicates the initiative being considered

**Column 2:** Key objectives pursued.  
- B – Broad (2 points),  
- F – Focused (10 points) (max score 100)

**Column 3:** Key measures used.  
- A – Aligned (10 points),  
- G – Generic (2 points) (max score 100)

**Column 4:** Culture identified.  
- Open/supportive (50),  
- Neutral (25),  
- Apathetic (12),  
- Hostile (0)

**Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)

**Column 6:** Total score

Maximum score possible 180 points for initiative described above

% potential success rate for this initiative = 23%
Appendix 11E: Therm Tempered Limited – Initiative Measurement Process - Initial benchmark

<table>
<thead>
<tr>
<th>Initiative</th>
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<tr>
<td>Use new tools and techniques to improve the business and manage growth – (Forced change using the management team to drive)</td>
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<td>4 A 40</td>
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**Explanation**

Column 1: Indicates the initiative being considered

Column 2: Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score 100)

Column 3: Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 100)

Column 4: Culture Identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)

Column 5: Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)

Column 6: Total score

Maximum score possible 190 points for initiative described above

% potential success rate for this initiative = 57%
### Appendix 11F: Therm Tempered Limited – Initiative Measurement Process – Using training to develop skills, commitment and culture change

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<thead>
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<th>Initiative</th>
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<th>3</th>
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<td><strong>Key objectives</strong></td>
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<td>B or F</td>
<td>Score</td>
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</tr>
<tr>
<td>Introduce new tools and techniques to drive change through the middle management change. Without training</td>
<td>5</td>
<td>F</td>
<td>50</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>Estimated chance of success with training</td>
<td>5</td>
<td>F</td>
<td>50</td>
<td>4</td>
<td>A</td>
</tr>
</tbody>
</table>

**Explanation**

Column 1: Indicates the initiative being considered

Column 2: Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score 100)

Column 3: Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 100)

Column 4: Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)

Column 5: Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)

Column 6: Total score

Maximum score possible 190 points for initiative described above

% potential success rate for this initiative ‘without training’ = 57%

% potential success rate for this initiative with management development and training = 84%
Appendix 12
Experiment 3: List of Appendices

Appendix 12A: Summary of Diagnostic Review held on 10th Feb 2004
Appendix 12B: Performance Measures link to Key Objectives 170304
Appendix 12C: Example of 5S review sheet – Diagnostics
Appendix 12D: Example of completed 5S Audit
Appendix 12E: Summary of Actions 17th March 2004
Appendix 12F: Performance Measures Summary of Discussion 150404
Appendix 12G: Performance Measures Summary of Discussion 040504
Appendix 12H: Performance Measures link to Key Objectives 040504
Appendix 12J: Initiative Measurement Process Progress Review 040504
Appendix 12K: Performance Measures Summary of Discussion 270504
Appendix 12L: Performance Measures link to Key Objectives 270504
Appendix 12M: Initiative Measurement Process - Progress Review 270504
Appendix 12N: Comments and Actions from IMP 270504
Appendix 12P: Performance Measures Summary of Discussion 070704
Appendix 12Q: Review Scores - comparison 070704
Appendix 12R: Logistics Area Review Progress Graph
Appendix 12S: Service Centre Achievement of Objectives
Appendix 12T: Initiative Measurement Process - Ongoing process, Review 070704
Appendix 12V: Initiative Measurement Process – Progress Review 070704
Appendix 12W: Comments and Actions from IMP 070704
Appendix 12A - Summary of Diagnostic Review held on 10th Feb 2004

Statement of why\(s\)
Growth in the number of laptops being serviced has increased and is likely to increase further. Thus, there has been customer pressure and to a lesser degree corporate pressure to improve the performance of the Service Centre. Thus the main driver for improvement is:

- Growth
  - Customer Pressure
  - Corporate Pressure

Statement of what\(s\) – key objectives
Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005
Increase throughput to support 200 units per week whilst maintaining TAT
Reduce the number of bouncers
Measure test quality and reduce in line with a plan over the next 6 months
Identify and pinpoint problems earlier in the process
More accurate forecasting for spares
Reduce Lead Time for spares
Offer a repair service for products for 7 years

Identifying the how\(s\)
Lean Manufacturing
Supply Chain Management
5S
Business Process Re-engineering
Cellular manufacturing
Many of the elements of the above techniques will be useful in undertaking this project.

Performance Measures
Inventory Turns
TAT
Supplier Delivery Performance
Define the Nature of the Change
The change can be described as proactive in that it is driven by the Service Manager and is anticipating possible growing pressure from customers and senior managers. The force for change currently within the management team is strong. There is no external pressure, yet, on the company to change although this is likely to alter in the near future. From the grid the type of improvement is identified as a Step Change.
The degree of urgency required, as perceived by the analysis undertaken is medium/high.

Cultural Analysis
Scores for organisation – 72 and 90
This indicates a neutral culture with an underlying apathy. This is a realistic assessment of the general culture that exists within Service, at present.

Summary of path 2 progress
Degree of urgency – medium/high
Culture – Neutral
Type of improvement required – Step Change

Culture match with change requirement
From the graph there is a mismatch between the degree of likely support for the change from the workforce and the degree of urgency required.

Most appropriate option for change initiative
Pilot Study – bottom up using 5S
Pilot study – top down using process mapping
Management commitment support and drive is essential
It is recommended that the initiative is management driven and commences with a pilot study. There is a potential issue regarding the degree of urgency required against the likely degree of urgency that will initially be generated. Culture change is required within the organisation.

Summary of outcomes from path 1 and path 2

Key objectives
Reduce Turnaround Time (TAT) to less than 2 days by the end of March
Increase throughput to support 200 units per week whilst maintaining TAT
Reduce the number of bouncers
Measure test quality and reduce in line with a plan over the next 6 months
Identify and pinpoint problems earlier in the process
More accurate forecasting for spares
Reduce Lead Time for spares
Offer a repair service for products for 7 years

Identifying the hows
Lean Manufacturing
Supply Chain Management
5S
Business Process Re-engineering
Cellular manufacturing

Performance Measures
Inventory Turns
TAT
Supplier Delivery Performance
Numbers of returns / bouncers
Internal PPM or equivalent quality measure
5S audit/review
Degree of urgency – medium/high

Culture – neutral

Type of improvement required – Step Change

**IMP initial analysis**

Key objectives identified 8, 2 focused, 4 broad. =

Key measures identified 6, all aligned. = (However only TAT is in place)

Culture, neutral = 22

Top down commitment = 50

**Score based on all Performance Measures being in place**

Total score = 164 (possible 240 max based on 8 objectives & 6 key measures)

Score = 68%

**Current Score with only TAT in Place**

Total score = 114 (possible 240 max based on 8 objectives & 6 key measures)

Score = 47.5%

**Recommendations:**

Applying the model indicated that there is a need to work on the general culture of the organisation. A positive way of doing this is to undertake a management driven pilot exercise in one area to test the ideas and develop commitment within the management team and the workforce. There is a need to raise the urgency level and a pilot study may support this. The objectives need to be more focused and it is recommended that a number of short, sharp, focused objectives are developed. Also the performance measures identified need to be introduced and used. A communication strategy may also need to be employed and the need for external support in respect of the techniques to be applied should be considered.
APPENDIX 12A

Initiative Measurement Process – Initial Benchmark with all performance measures in place 10th Feb 2004

<table>
<thead>
<tr>
<th>Initiative</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Key objectives</td>
<td>Key measures</td>
<td>Culture</td>
<td>Top down commitment</td>
<td>Score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number</td>
<td>B or F</td>
<td>Score</td>
<td>Number</td>
<td>A or G</td>
</tr>
<tr>
<td>Service Centre Growth</td>
<td>8</td>
<td>2F, 6B</td>
<td>32</td>
<td>6</td>
<td>A</td>
<td>60</td>
</tr>
</tbody>
</table>

**Explanation**

- **Column 1:** Indicates the initiative being considered
- **Column 2:** Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score 80)
- **Column 3:** Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 60)
- **Column 4:** Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
- **Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
- **Column 6:** Total score

Maximum score possible 240 points: Potential % success rating 68%
<table>
<thead>
<tr>
<th>Initiative</th>
<th>Key objectives</th>
<th>Score</th>
<th>Culture</th>
<th>Top down commitment</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Centre Growth</td>
<td>8</td>
<td>2F, 6B</td>
<td>32</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>114</td>
</tr>
</tbody>
</table>

**Explanation**
- Indicates the initiative being considered
- B = Broad (2 points), F = Focused (10 points), (max score 80)
- A – Aligned (10 points), G – Generic (2 points) (max score 60)
- Open/Supportive (30), neutral (25), apathetic (12), hostile (0)
- Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (60 points)

**Maximum score possible 240 points:**
Potential% success rating 47.5%
## APPENDIX 12B: Performance Measures link to Key Objectives

Status at 170304

<table>
<thead>
<tr>
<th>Objective</th>
<th>Measure</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005</td>
<td>TAT Time</td>
<td>In Place</td>
</tr>
<tr>
<td>Increase throughput to support 200 units per week whilst maintaining TAT</td>
<td>Throughput / Efficiency</td>
<td>On Trial</td>
</tr>
<tr>
<td>Reduce the number of bouncers</td>
<td>External - % monthly from customers</td>
<td>Not in place</td>
</tr>
<tr>
<td>Measure test quality and reduce in line with a plan over the next 6 months</td>
<td>Internal - % Test Failures</td>
<td>Not in place</td>
</tr>
<tr>
<td>Identify and pinpoint problems earlier in the process</td>
<td>Internal - % Test Failures</td>
<td>Not in place</td>
</tr>
<tr>
<td>More accurate forecasting for spares</td>
<td>Inventory Accuracy</td>
<td>Not in place</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Nos. of stock outs</td>
<td>Not in place</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Current lead times</td>
<td>Not in place</td>
</tr>
<tr>
<td>Offer a repair service for products for 7 years</td>
<td>Delivery Performance</td>
<td>Not in place</td>
</tr>
<tr>
<td>Workplace Organisation and Housekeeping to 85% in each area by April 2005</td>
<td>5S measures</td>
<td>Not in Place</td>
</tr>
</tbody>
</table>
## Diagnostics

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Improvement Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There are no items lying around the area such as unused laptops, cleaning equipment etc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The floors are clear, there is no danger of slipping. There are no trip hazards in the area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Display boards are all neat and tidy. No outdated torn or soiled displays no torn corners or tape marks or tape marks left over from old displays.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>All emergency exits are accessible and free from obstructions. All fire extinguishers are accessible and free from obstructions. All safety risk areas are clearly marked.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>No stock is stored directly on the floor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>All storage is well organised. All stored items are clearly marked.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Designated areas for the trolleys are marked out.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Trolleys are kept in the designated areas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>All documents at the workplace are stored so that they are easy to use and retrieve.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>All procedures and documentation conforms to ISO 9000:2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>All shelves and working areas are properly stocked with appropriate items for the area and have clearly defined locations and labels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Description</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>Improvement Notes</td>
</tr>
<tr>
<td>----</td>
<td>------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>-------------------</td>
</tr>
<tr>
<td>12</td>
<td>The contents of drawers are relevant and organised.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>No personal items are visible in the working area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Rubbish bins are removed on a timely basis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>There is a place for everything and everything in its place. Only items with a place are present.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Working procedures have been developed, where required</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Working instructions have been developed, where required</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Working Instructions are clear and easy to follow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Working procedures and working instructions are available and used</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>There is a clear defined and marked process for material flow in and out of diagnostics area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Appropriate safety and anti-static equipment is worn.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Company dress code is adhered to.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Areas</td>
<td>Cluttered</td>
<td>Unnecessary Items Present</td>
<td>Comments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-----------</td>
<td>---------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Items Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unnecessary Items Present</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Area</td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Items Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unnecessary Items Present</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Items Present On Notice Boards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unnecessary Items Present On Notice Boards</td>
<td>✓</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Red Tag</td>
<td>No Red Tag Quarantine Area Present</td>
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<td>✓</td>
<td>Red Tag Quarantine Area Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red Tag Quarantine Area Not In Use</td>
<td>✓</td>
<td>✓</td>
<td>Red Tag Quarantine Area In Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td>Red Tagged Items In Quarantine Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red Tags Not Correctly Filed In</td>
<td>✓</td>
<td>✓</td>
<td>Red Tags Correctly Filed In</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>System For Registering Red Tag Items Not Set Up</td>
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<td>✓</td>
<td>System For Registering Red Tag Items Set Up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Acceptable Disposal System Present (Financial/Environmental)</td>
<td>✓</td>
<td>✓</td>
<td>Acceptable Disposal System Present (Financial/Environmental)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Surfaces</td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Unnecessary Items Not Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unnecessary Items Present</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>People</td>
<td>0% Attended SS Workshop</td>
<td>✓</td>
<td>✓</td>
<td>100% Attended SS Workshop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td>Manager Attended Awareness Workshop</td>
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<td>Team Leader Not Attended Awareness Workshop</td>
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<td>Team Leader Attended Awareness Workshop</td>
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<tr>
<td></td>
<td>Negligible Active Participation</td>
<td>✓</td>
<td>✓</td>
<td>Pro-Active Participation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage/Drawers/Cupboards</td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Unnecessary Items Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unnecessary Items Present</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment/Tools</td>
<td>Unnecessary Items Present</td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Items Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Uncluttered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Unnecessary Materials Present</td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Materials Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Uncluttered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labels</td>
<td>Unnecessary Labels Present</td>
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<td>✓</td>
<td>Only Necessary Labels Present</td>
<td></td>
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</tr>
<tr>
<td>Documentation</td>
<td>Unnecessary Documents Present</td>
<td>✓</td>
<td>✓</td>
<td>Only Necessary Documents Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cluttered</td>
<td>✓</td>
<td>✓</td>
<td>Uncluttered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Measures</td>
<td>Inappropriate Performance Measures Are Used</td>
<td>✓</td>
<td>✓</td>
<td>Inappropriate Performance Measures Have Been Discarded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor: Aisle</td>
<td>Not Marked Out</td>
<td>Check</td>
<td>Clearly Marked Out</td>
<td>Comments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>-------</td>
<td>--------------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Identified Storage Locations</td>
<td></td>
<td></td>
<td>A Place For Everything - Clearly Identified And Labelled</td>
<td>WALKWAYS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Items Stored In Correct Locations</td>
<td>✓</td>
<td></td>
<td>Everything In Its Place</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Floor: Work Area</th>
<th>Not Marked Out</th>
<th>Check</th>
<th>Clearly Marked Out</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Identified Storage Locations</td>
<td></td>
<td></td>
<td>A Place For Everything - Clearly Identified And Labelled</td>
<td></td>
</tr>
<tr>
<td>No Items Stored In Correct Locations</td>
<td>✓</td>
<td></td>
<td>Everything In Its Place</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Walls</th>
<th>Items Not Identified</th>
<th>✓</th>
<th>All Items Clearly Identified And Labelled</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice Boards Inappropriately Located</td>
<td>✓</td>
<td></td>
<td>Notice Boards Located Appropriately</td>
<td></td>
</tr>
<tr>
<td>Notice Board Postings Disordered</td>
<td>✓</td>
<td></td>
<td>Notice Board Postings Ordered</td>
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<table>
<thead>
<tr>
<th>Red Tag</th>
<th>Red Tag Area Identified But Not Used</th>
<th>✓</th>
<th>Red Tag Area And Fully Utilised</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Tag Items Not Regularly Reviewed</td>
<td>✓</td>
<td></td>
<td>Red Tag Items Regularly Reviewed (No Out-of-Date Red Tags)</td>
<td></td>
</tr>
<tr>
<td>Red Tag Area Disorganised</td>
<td>✓</td>
<td></td>
<td>Red Tag Area Organised</td>
<td></td>
</tr>
<tr>
<td>Red Tagged Items Not In Identified Red Tag Area</td>
<td>✓</td>
<td></td>
<td>All Red Tagged Items In Identified Red Tag Area</td>
<td></td>
</tr>
<tr>
<td>Red Tags Not Correctly Filed In</td>
<td>✓</td>
<td></td>
<td>Red Tags Correctly Filed In</td>
<td></td>
</tr>
<tr>
<td>System For Registering Red Tag Items Not Being Used</td>
<td>✓</td>
<td></td>
<td>System For Registering Red Tag Items Being Fully Utilised</td>
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<tr>
<td>No Acceptable Disposal System Present</td>
<td>✓</td>
<td></td>
<td>Acceptable Disposal System Present (Financial/Environmental)</td>
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</table>

<table>
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<tr>
<th>Work Surfaces</th>
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<th>Clearly Marked Out</th>
<th>Comments</th>
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<tbody>
<tr>
<td>No Identified Storage Locations</td>
<td>✓</td>
<td></td>
<td>A Place For Everything - Clearly Identified And Labelled</td>
<td></td>
</tr>
<tr>
<td>No Items Stored In Correct Locations</td>
<td>✓</td>
<td></td>
<td>Everything In Its Place</td>
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<table>
<thead>
<tr>
<th>People</th>
<th>Negligible Active Participation in 'Set in Order' Activities</th>
<th>✓</th>
<th>Active Participation In 'Set in Order' Activities</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader Not Able To Commit To 5S</td>
<td>✓</td>
<td></td>
<td>Team Leader Fully Committed To 5S</td>
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<table>
<thead>
<tr>
<th>Storage/Drawers/Cupboards</th>
<th>No Identified Storage Locations</th>
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<th>A Place For Everything - Clearly Identified And Labelled</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>No Items Stored In Correct Locations</td>
<td>✓</td>
<td></td>
<td>Everything In Its Place</td>
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</tr>
<tr>
<td>Contents Hidden</td>
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<td>Contents Visible</td>
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<table>
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<th>Equipment/Tools</th>
<th>Not Conveniently Located</th>
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<th>All Conveniently Located</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items Not Clearly Identified</td>
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<td></td>
<td>A Place For Everything - Clearly Identified And Labelled</td>
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<table>
<thead>
<tr>
<th>Materials</th>
<th>No indication of acceptable levels</th>
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<th>All levels clearly indicated</th>
<th>Comments</th>
</tr>
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<tbody>
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<td>No Identified Storage Locations</td>
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<td></td>
<td>A Place For Everything - Clearly Identified And Labelled</td>
<td></td>
</tr>
<tr>
<td>No Material Stored In Correct Locations</td>
<td>✓</td>
<td></td>
<td>Everything In Its Place</td>
<td></td>
</tr>
<tr>
<td>Not Conveniently Located</td>
<td>✓</td>
<td></td>
<td>All Conveniently Located</td>
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<table>
<thead>
<tr>
<th>Documentation</th>
<th>Not Available</th>
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<th>All Documents Available</th>
<th>Comments</th>
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<td>Not Conveniently Located</td>
<td>✓</td>
<td></td>
<td>All Conveniently Located</td>
<td></td>
</tr>
<tr>
<td>No Documents Comply With Current Control Requirements</td>
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<td></td>
<td>All Documents Comply With Current Control Requirements</td>
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<table>
<thead>
<tr>
<th>Performance Measures</th>
<th>Appropriate Performance Measures Have Not Been Developed</th>
<th>✓</th>
<th>Appropriate Performance Measures Developed And Used</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Measures Are Not Aligned to Company Goals</td>
<td>✓</td>
<td></td>
<td>Performance Measures Are Aligned to Company Goals</td>
<td></td>
</tr>
<tr>
<td>Improvement Targets Have Not Been Established</td>
<td>✓</td>
<td></td>
<td>Improvement Targets Have Been Established</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Areas</td>
<td>Clean</td>
<td>In Good Repair</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Floor</td>
<td>Aisles</td>
<td>Clean</td>
<td>In Good Repair</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Work Area</td>
<td>Clean</td>
<td>In Good Repair</td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td>Unclean</td>
<td>Clean</td>
<td>In Good Repair</td>
<td></td>
</tr>
<tr>
<td>Red Tag</td>
<td>Disposal System Not Used (Financial/Environmental)</td>
<td>Clean</td>
<td>In Good Repair</td>
<td></td>
</tr>
<tr>
<td>Work Surfaces</td>
<td>Unclean</td>
<td>Clean</td>
<td>In Good Repair</td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>Negligible Active Participation In 'Shine' Activities</td>
<td>Active Participation In 'Shine' Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage/Drawers/Cupboards</td>
<td>Unclean And Disordered</td>
<td>Clean And Well Ordered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment/Tools</td>
<td>Clean</td>
<td>Maintained</td>
<td>In Good Repair</td>
<td>Clearing Methods Used To Identify And Correct Potential Faults</td>
</tr>
<tr>
<td>Materials</td>
<td>Not Maintaining Acceptable Levels</td>
<td>Maintaining Acceptable Levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labels</td>
<td>Labels Inappropriate And/Or Damaged</td>
<td>Labels Appropriate And Undamaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Measures</td>
<td>Performance Measures Are Not Used To Drive Improvement</td>
<td>Performance Measures Are Being Used To Drive Improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement Targets Are Not Assessed</td>
<td>Improvement Targets Are Assessed And Updated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area Reviewed</td>
<td>Date</td>
<td>Auditor</td>
<td>Standards</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Floor:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asles, Work Areas, Walls and Work Surfaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Checklists To Monitor Cleaning</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Process To Ensure Any Damage Immediately Rectified</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Markings Not Compliant With Company Standards</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>All Line Markings Are Compliant with Company Standards</td>
</tr>
<tr>
<td>Red Tag</td>
<td></td>
<td></td>
<td>✓</td>
<td>Red Tag Approach Is Not Systematically Applied</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Staff Are Unable To Explain The Importance Of SS And Their Role In It</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>All Staff Are Able To Explain The Importance Of SS And Their Role In It</td>
</tr>
<tr>
<td>No System Exists That Encourages and Records Improvement Opportunities</td>
<td>✓</td>
<td></td>
<td></td>
<td>A System Exists That Encourages and Records Improvement Opportunities</td>
</tr>
<tr>
<td>Staff Do Not Conduct Themselves To Maximise SS Standards</td>
<td>✓</td>
<td></td>
<td></td>
<td>All Staff Conduct Themselves To Maximise SS Standards</td>
</tr>
<tr>
<td>Storage/Closets/Cupboards</td>
<td></td>
<td></td>
<td>✓</td>
<td>Included And Monitored As An Item On Cleaning Checklists</td>
</tr>
<tr>
<td>Equipment/Tools</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No Preventative Maintenance System In Place</td>
<td>✓</td>
<td></td>
<td></td>
<td>Preventative Maintenance System In Place And Routinely Followed</td>
</tr>
<tr>
<td>Tools And Equipment Are Not Returned To Storage Area After Use</td>
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<td></td>
<td></td>
<td>All Tools And Equipment Are Returned To Storage Area Immediately After Use</td>
</tr>
<tr>
<td>Materials</td>
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<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Inappropriate type and quantity of materials supplied</td>
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<td></td>
<td></td>
<td>Only Materials Being Currently Used For The Job Is At That Location</td>
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<tr>
<td>No visible system for material movement and quantities</td>
<td>✓</td>
<td></td>
<td></td>
<td>Material Movement And Quantities Controlled By A Visible System</td>
</tr>
<tr>
<td>Labels</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Labels Not To Company Standards</td>
<td>✓</td>
<td></td>
<td></td>
<td>All Labels Are To Company Standards</td>
</tr>
<tr>
<td>Documentation</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No Simple Visual Documentation Used</td>
<td>✓</td>
<td></td>
<td></td>
<td>Only Simple Visual Documentation Used</td>
</tr>
<tr>
<td>Performance Measures</td>
<td></td>
<td></td>
<td>✓</td>
<td>Performance Measures Integrated Into Performance Appraisal System</td>
</tr>
<tr>
<td>No Systematic Process For Undertaking Regular SS Audits Exists</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>A Systematic Process For Undertaking Regular SS Audits Is Used</td>
</tr>
</tbody>
</table>

4294
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No Checklists Are Up To Date, Visible And Fully Utilised</td>
<td>All Checklists Are Up To Date, Visible And Fully Utilised</td>
<td>Red Tagging Is Still Used Frequently</td>
<td>At Least 50% Of Staff Are Able To Train Others In SS Activities</td>
<td>Operators Do Not Manage And Undertake Preventative Maintenance</td>
<td>No Review Is Carried Out</td>
<td>No Guidelines Exist To Create Simple Visual Documentation</td>
<td>Department Shows No Improvement On SS Audit Scores</td>
</tr>
<tr>
<td>Checklists Are Not Used As A Driver For Continuous Improvement</td>
<td>Checklists Used As A Driver For Continuous Improvement</td>
<td>Red Tagging Is Used When Necessary (But Very Rarely Needed)</td>
<td>All Staff Are Fully Trained And Competent In Their Job Function</td>
<td>Operators Manage And Undertake Preventative Maintenance</td>
<td>A System Of Continuous Review Is In Place And Used</td>
<td>Guidelines Are Used To Create Simple Visual Documentation</td>
<td>Department Shows Continual Improvement On SS Audit Scores</td>
</tr>
<tr>
<td>Checklists Are Not Reviewed</td>
<td>Checklists Are Reviewed And Updated On A Quarterly Basis</td>
<td></td>
<td>No SS Audits Are Undertaken By Staff</td>
<td></td>
<td></td>
<td>Opportunities To Reduce Documentation Are Regularly Pursued</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Comments</th>
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<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 12E: Summary of Actions 17th March 2004

5S Service Project: Logistics:

A system for refurbishment of packing material is required
- Pull when required from Kintetsu
- Regular orders from supplier, weekly?, quantities?
- Manage levels

BT transport boxes. Temporarily held in the stores. Require a system for storage and movement

Cardboard Boxes
- 320 stored under the bench
- at least 500 on a pallet for Kontetsu
- Usage approx. 300 per week
- Needs a system

HDD boxes
- currently hold approx 140
- use around 10 per week
- re-order in boxes of 50

Approx 60 to be sent to Kontetsu

Cushion and Sleeve boxes PN – PPC20673
- 80 on pallet for return to Kontetsu
- Use approx 50 per week

Notice for Goods Inward trolley required

Bin to be ordered

Investigate DHL software for printer
APPENDIX 12F: Performance Measures Summary of Discussion

Service Centre: 15th April 2004

1. Productivity / Efficiency

   Time worked on unit against standard time allowed

<table>
<thead>
<tr>
<th>Easy</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

2. Throughput

   Numbers completed against target

<table>
<thead>
<tr>
<th>Easy</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

3. Staffing Levels

   Temp / Permanent Ratios for Leicester and Cardiff: see examples below

4. TAT Time

   Split into two areas: Straight Repair and ‘Others’ Measure is from product received to product shipped.

   Also measure from ‘call logged’ to ‘product received’

5. Quality

   External - % monthly from customers

   Internal - % Test Failures, collected daily, reported weekly
6. Delivery Performance

% outstanding every month against order duration - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

Orders received against delivery time - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

7. Stores

Inventory Accuracy

Stock outs or 'no parts available'

8. 5S - Housekeeping / Workplace Organisation

Overall Monthly detailed audit score

Individual department Reviews - Monthly
APPENDIX 12G: Performance Measures Summary of Discussion

Service Centre: 04th May 2004

1. Productivity / Efficiency

Easy and hard not required. Graphs are set up. Need to collect data and trial over a month.

2. Throughput

Easy and hard separate graphs set up – individual daily
Cumulative weekly set up - easy
Cumulative weekly set up – hard
Cumulative monthly set up - easy and hard

3. Staffing Levels

Monthly bar chart, Cardiff temp/perm set up
Monthly bar chart Leicester BG/BT set up
% temps to perm charts done for Cardiff, BT Leicester and BG Leicester

4. TAT Time

Measure is from product received to product shipped, being controlled by Stuart.
Measure from ‘call logged’ to ‘product received’ is on hold at the moment

5. Quality

External - % monthly from customers to be set up by Siebel Administrator
Internal - % Test Failures, collected daily, reported weekly, to be set up by David Lloyd from the 1st June.

6. Delivery Performance

% outstanding every month against order duration - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months
Orders received against delivery time - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months
Action: Both to be set up by Stuart
7. Stores

Inventory Accuracy
   a. Secure stores required
   b. Need to introduce pick system
Action: Simon Williams to develop figures by end of May

Stock outs or 'no parts available'
Action: Anthony Donaldson to set up by the end of May

8. 5S - Housekeeping / Workplace Organisation

Overall Monthly detailed audit score set up and measured for March and April. Also monthly individual department reviews have been set up for Logistics, Help Desk and the Office. Again March and April scores are available.

Anthony needs to carry out the 5S audits and feed through the data, monthly, to Darren.

Next Review: Wednesday 2nd June 2004
### APPENDIX 12H: Performance Measures link to Key Objectives

**Status at 040504**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Measure</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005</td>
<td>TAT Time</td>
<td>In Place</td>
</tr>
<tr>
<td>Increase throughput to support 200 units per week whilst maintaining TAT</td>
<td>Throughput / Efficiency</td>
<td>On Trial</td>
</tr>
<tr>
<td>Reduce the number of bouncers</td>
<td>External - % monthly from customers</td>
<td>Not in place</td>
</tr>
<tr>
<td>Measure test quality and reduce in line with a plan over the next 6 months</td>
<td>Internal - % Test Failures</td>
<td>Not in place</td>
</tr>
<tr>
<td>Identify and pinpoint problems earlier in the process</td>
<td>Internal - % Test Failures</td>
<td>Not in place</td>
</tr>
<tr>
<td>More accurate forecasting for spares</td>
<td>Inventory Accuracy</td>
<td>Not in place</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Nos. of stock outs</td>
<td>Not in place</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Current lead times</td>
<td>Not in place</td>
</tr>
<tr>
<td>Offer a repair service for products for 7 years</td>
<td>Delivery Performance</td>
<td>Not in place</td>
</tr>
<tr>
<td>Workplace Organisation and Housekeeping to 85% in each area by April 2005</td>
<td>5S measures</td>
<td>In Place</td>
</tr>
</tbody>
</table>

Ref: service. Measures link to objectives
<table>
<thead>
<tr>
<th>1</th>
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</tr>
</thead>
<tbody>
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<td>Initiative</td>
<td>Key objectives</td>
<td>Key measures</td>
<td>Culture</td>
<td>Top down commitment</td>
<td>Score</td>
</tr>
<tr>
<td>Number</td>
<td>B or F</td>
<td>Score</td>
<td>Number</td>
<td>A or G</td>
<td>Score</td>
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<tr>
<td>Service Centre Growth</td>
<td>9</td>
<td>5F, 4B</td>
<td>58</td>
<td>2 in place</td>
<td>A</td>
</tr>
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</table>

Explanation:

Column 1: Indicates the initiative being considered
Column 2: Key objectives pursued. B – Broad (2 points), F – Focused (10 points) (max score available 90)
Column 3: Key measures used. A – Aligned (10 points), G – Generic (2 points) (max score 90)
Column 4: Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
Column 5: Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
Column 6: Total score

Maximum score possible 280 points: Potential % success rating 54%
APPENDIX 12K: Performance Measures Summary of Discussion

Service Centre: 27th May 2004

1. Productivity / Efficiency
Easy and hard no required. Graphs are set up. Need to collect data and trial over a month.

*Graphs in place, data to be added over the next few weeks*

2. Throughput
Easy and hard separate graphs set up – individual daily
Cumulative weekly set up - easy
Cumulative weekly set up – hard
Cumulative monthly set up - easy and hard

*In place. One month’s data collected – need to be discussed and fed back to individuals.*

3. Staffing Levels
Monthly bar chart, Cardiff temp/perm set up
Monthly bar chart Leicester BG/BT set up
% temps to perm charts done for Cardiff, BT Leicester and BG Leicester

*In Place – being monitored*

4. TAT Time
Measure is from product received to product shipped, being controlled by Stuart.
Measure from 'call logged' to 'product received' is on hold at the moment

*Stuart and Anthony are putting this together. Next step is to look deeper and understand the reasons for not hitting the targets*

5. Quality
External - % monthly from customers to be set up by Siebel Administrator

*Being set up by Lee and Victoria (Torie) ... in place by next meeting*

Internal - % Test Failures, collected daily, reported weekly, to be set up by David Lloyd from the 1st June.

*No action to date – to be developed*
6. Delivery Performance
% outstanding every month against order duration - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

Orders received against delivery time - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

*Set up by Stuart, not able to be viewed at present*

7. Stores
Inventory Accuracy
a. Secure stores required
b. Need to introduce pick system

*Simon Williams to develop figures by end of July (issues with Siebel)*

Stock outs or 'no parts available'

*Anthony Donaldson to set up by the end of May. Graph of measure to be developed – actions then introduced to drive downwards.*

8. 5S - Housekeeping / Workplace Organisation
Overall Monthly detailed audit score set up and measured for March and April. Also monthly individual department reviews have been set up for Logistics, Help Desk and the Office. March, April and May scores are available.

*Anthony needs to carry out the 5S audits and feed through the data, monthly, to Darren. Next 5S session to be held on Tuesday 8th June.*

9. Other measures
Sickness – recorded for 3 sites
Holidays
Overtime

General
3 up charts to be developed, initially for 5S review (AB)
5S needs to be driven, Chris to support Anthony, Darren to take a more proactive role.
IMP measure to be supplied and used as an ongoing measure (AB)

Next Review: Wednesday 30\(^{\text{nd}}\) June 2004
## APPENDIX 12L: Performance Measures link to Key Objectives

### Status at 27th May 2004

<table>
<thead>
<tr>
<th>Objective</th>
<th>Measure</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005</td>
<td>TAT Time</td>
<td>In Place</td>
</tr>
<tr>
<td>Increase throughput to support 200 units per week whilst maintaining TAT</td>
<td>Throughput / Efficiency</td>
<td>In place – feedback to people reqd.</td>
</tr>
<tr>
<td>Reduce the number of bouncers</td>
<td>External - % monthly from customers</td>
<td>Information available – needs to be displayed</td>
</tr>
<tr>
<td>Measure test quality and reduce in line with a plan over the next 6 months</td>
<td>Internal - % Test Failures</td>
<td>Being developed</td>
</tr>
<tr>
<td>Identify and pinpoint problems earlier in the process</td>
<td>Internal - % Test Failures</td>
<td>Being Developed</td>
</tr>
<tr>
<td>More accurate forecasting for spares</td>
<td>Inventory Accuracy</td>
<td>Siebel – PSI programme (not in use yet)</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Nos. of stock outs</td>
<td>Anthony to start displaying</td>
</tr>
<tr>
<td>Reduce Lead Time for spares</td>
<td>Current lead times</td>
<td>Actions in place - Stuart</td>
</tr>
<tr>
<td>Offer a repair service for products for 7 years</td>
<td>Delivery Performance</td>
<td>Ongoing dev</td>
</tr>
<tr>
<td>Workplace Organisation and Housekeeping to 85% in each area by April 2005</td>
<td>5S measures</td>
<td>In Place</td>
</tr>
</tbody>
</table>
### APPENDIX 12M: Initiative Measurement Process – Progress Review 270504

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiative</td>
<td>Key objectives</td>
<td>Key measures</td>
<td>Culture</td>
<td>Top down</td>
<td>Score</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>B or F</td>
<td>Score</td>
<td>commitment</td>
<td></td>
</tr>
<tr>
<td>Service Centre Growth</td>
<td>9 5F, 4B 58</td>
<td>4 A 40</td>
<td>12</td>
<td>34</td>
<td>144</td>
</tr>
</tbody>
</table>

### Explanation

**Column 1:** Indicates the initiative being considered

**Column 2:** Key objectives pursued. **B** – Broad (2 points), **F** – Focused (10 points) (max score available 90)

**Column 3:** Key measures used. **A** – Aligned (10 points), **G** – Generic (2 points) (max score 90)

**Column 4:** Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)

**Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)

**Column 6:** Total score

Maximum score possible 280 points: Current % success rating 51%
APPENDIX 12N: Comments and Actions from IMP

Service Centre: 27th May 2004

Comments

- Progress being made on the development of appropriate Performance Measures but measures not yet in place (other than IMP). For this reason the initial benchmark version of the IMP was used.

- Management commitment towards the improvement initiative had slackened over the past month or so due to other commitments.

- Workshop re-organisation into cells almost complete

- 5S measures and actions in place, little response from service centre technicians at present

- Culture questionnaire filled in and showed regression from a neutral/partly apathetic culture to a clear culture of apathy

- It was concluded through discussion with the Service Centre Manager and the 5S co-ordinator that the current culture score accurately portrayed the current culture of the workshop.

- One reason given for the reduction in score of the culture was that the 5S initiative had exposed the apathy that was already there. Prior to 5S change had been carried out ON the people rather than WITH them.

Actions Agreed

- Management were determined to move forward and showed their renewed commitment by providing further support to the 5S co-ordinator in respect of an additional person to assist with driving 5S forward.

- Culture change was key!!! 5S would be used to facilitate this.

- Performance measures would continue to be developed in line with the objectives. Current measures would be used to drive improvement.

- A further meeting was arranged to discuss and develop the measures and review 5S activities

- Other improvements linked to performance measures would be introduced in due course
APPENDIX 12P: Performance Measures Summary of Discussion

Service Centre: 7th July 2004

1. Productivity / Efficiency
Easy and hard no required. Graphs are set up. Need to collect data and trial over a month.

*Graphs in place, data still to be added*

2. Throughput
Easy and hard separate graphs set up – individual daily
Cumulative weekly set up - easy
Cumulative weekly set up – hard
Cumulative monthly set up - easy and hard

*Graphs working well showing improvement*
Will compare with 'bouncers' to determine if quality is being sacrificed for speed
Add a quarterly report

3. Staffing Levels
Monthly bar chart, Cardiff temp/perm set up
Monthly bar chart Leicester BG/BT set up
% temps to perm charts done for Cardiff, BT Leicester and BG Leicester

*Showing change due to increase of Temps. This is a slight worry, there is a ned for permanent staff*

4. TAT Time
Measure is from product received to product shipped, being controlled by Stuart.
Measure from ‘call logged’ to ‘product received’ is on hold at the moment

*Weekly report available and issued for TAT time. The target is 2 days. Initially at the start of the initiative TAT was 8.5 days. It is now down to around 2.2 days. In week ending 2nd July 76% of product was returned within 2 days*

5. Quality
External - % monthly from customers to be set up by Siebel Administrator

*Being modified on Siebel, Total figure available but need to develop to show repeaters. Report being developed. Also a report is available that gives the number of bouncers per individual*
Internal - % Test Failures, collected daily, reported weekly, to be set up by David Lloyd.

Data being collected and is available but needs to be analysed and put into graphical form

6. Delivery Performance
% outstanding every month against order duration - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

Orders received against delivery time - <1 month, 1-2 months, 2-3 months, 3-4 months, over 4 months

Set up by Stuart, not able to be viewed at present

7. Stores
Inventory Accuracy
a. Trial in place on a picking system
b. Store will be blocked off in the next few weeks and locked at night

Simon Williams to develop figures by end of July (issues with Siebel)

Stock outs or 'no parts available'

Anthony Donaldson to set up, on hold at present

8. 5S - Housekeeping / Workplace Organisation
Overall Monthly detailed audit score set up and measured for March and April. Also monthly individual department reviews have been set up for Logistics, Help Desk and the Office. March, April and May scores are available.

Measures showing ongoing improvement

9. Other measures
Sickness – recorded for 3 sites, Holidays, Overtime

General
5S needs to be driven, Chris is in place to support Anthony, Darren is taking a more proactive role.
   - Instruction given that benches must be tidied every day
   - Floors to be scrubbed regularly by cleaners

IMP measure to be completed (AB)

Next Review: End of August
APPENDIX 12R: Logistics Area Review

![Graph showing logistics area review with months March to August and percentage on the y-axis.]

- **March**: 20%
- **April**: 20%
- **May**: 25%
- **June**: 40%
- **July**: 50%
- **August**: 20%

Legend:
- **Actual Score**
- **Target Score**
APPENDIX 12S: Service Centre Achievement of Objectives

1. Reduce Turnaround Time (TAT) to less than 2 days by the end of March 2005
   90%

2. Increase throughput to support 200 units per week whilst maintaining TAT
   90%

3. Reduce the number of bouncers
   50% - measure being refined

4. Measure test quality and reduce in line with a plan over the next 6 months
   0%

5. Identify and pinpoint problems earlier in the process
   10%

6. More accurate forecasting for spares
   0%

7. Reduce Lead Time for spares
   0%

8. Offer a repair service for products for 7 years
   40%
<table>
<thead>
<tr>
<th>Initiative</th>
<th>% Achievement of objectives</th>
<th>% Success</th>
<th>Key objectives</th>
<th>Key measures</th>
<th>Culture</th>
<th>Top Down Commitment</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Growth</td>
<td>9 objectives being pursued</td>
<td>45%</td>
<td>9, 5F, 4B</td>
<td>58</td>
<td>A</td>
<td>50</td>
<td>18</td>
</tr>
</tbody>
</table>

**Explanation**

Column 1: Indicates the initiative being considered
Column 2: % achievement of goals based on number achieved against those undertaken
Column 3: % success in respect of other changes
Column 4: Key objectives pursued. No. = number, B = Broad (2 points), F = Focused (10 points)
Column 5: Key measures used. No. = number, Results 0 = not successful (0 points), Y = results successful (10 points)
Column 6: Culture identified. Open/supportive (50), neutral (25), apathetic (12), hostile (0)
Column 7: Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (50 points)
Column 8: Total score for each initiative
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiative</strong></td>
<td><strong>Key objectives</strong></td>
<td><strong>Culture</strong></td>
<td><strong>Score</strong></td>
<td><strong>Top down commitment</strong></td>
<td><strong>Score</strong></td>
</tr>
<tr>
<td>Service Centre Growth</td>
<td>9</td>
<td>5F, 4B</td>
<td>58</td>
<td>5</td>
<td>A</td>
</tr>
</tbody>
</table>

**Explanation**

- **Column 1:** Indicates the initiative being considered.
- **Column 2:** Key objectives pursued.
- **Column 3:** Key measures used.
- **Column 4:** Culture identified.
- **Column 5:** Top Down Commitment for initiative. Estimate points between no (0 points) to a maximum of fully committed (90 points).
- **Column 6:** Total score.

**Potential % success rating:** 59%
APPENDIX 12W: Comments and Actions from IMP

Service Centre: 7th July 2004

Comments

- Progress being made against certain key measures e.g. TAT. However, not all the measures are currently in place although this is improving. Again the initial benchmark version of the IMP was used as it was difficult to use the ongoing version. This area of the model needs to be reviewed.

- Management commitment towards the improvement initiative had become more focused following last month's meeting and discussion.

- Workshop re-organisation into cells is now complete

- 5S measures and actions in place. This is progressing slowly, as expected following the culture analysis.

Actions Agreed

- Management were determined to move forward and showed their renewed commitment by providing further support to the 5S co-ordinator in respect of an additional person to assist with driving 5S forward.

- Culture change was still key! 5S would be used to facilitate this.

- Performance measures would continue to be developed in line with the objectives. Current measures would be used to drive improvement.

- A further meeting was arranged to discuss and develop the measures and review 5S activities.
Appendix 13
Appendix 13: Nominal Group Technique - NGT

What is Nominal Group Technique?

This is a particular type of team brainstorming. NGT is a development of 'classic' brainstorming. NGT is a structured approach to idea generation.

When do we use NGT?

NGT can be used to generate ideas and for problem solving in business and manufacturing.

What is the benefit of NGT?

NGT draws on both individual and group strengths, preventing individuals from dominating the activity.

Key steps

- Assemble the team
- Explain the rules of NGT
- Read problem statement
- Problem clarification - team to explain problem in their own words
- Silent idea generation - write ideas on 'post it' stickers
- Round robin idea collection
- Idea clarification -
- Idea grouping
- Voting
- Rank ideas
Appendix 14: Brainstorming

What is ‘Brainstorming’?

Brainstorming is a technique, which encourages creative thinking and the generation of ideas in a short space of time without restrictions or criticism.

When do we use ‘Brainstorming’?

- Generating a list of problems and opportunities
- Identifying possible data requirements
- Developing objectives for solutions
- Generating possible solutions
- Developing actions plans

What is the benefit of ‘Brainstorming’?

- Many ideas are produced in a short time
- Enable all participants to contribute
- Encourage the generation of ‘unusual’ ideas
- Create a positive environment for teamwork and collaboration

Key steps

- Assemble the team to discuss the problem
- Take time to explain the ‘rules’ of brainstorming
- Write down the problem
- Discuss briefly - make sure that everyone understands the problem
- Encourage spontaneous ideas to be generated
- Avoid any criticism - allow all ideas
- Write down all ideas
- All suggestions are allowed - no argument or debate
- Aim for quantity
- Go round the team one by one, until there are no more ideas
- Now discuss each idea
- Group similar ideas
- Prune ideas which are considered not useful
- Rank ideas in order of potential effectiveness
- Use team consensus - be democratic - everyone gets involved
Appendix 15
Appendix 15: Examples of Potential Improvements

**SURVIVAL**

![Graph showing the relationship between degree of support for the change and dominant culture.](image)

**ESTABLISH LEADERSHIP**

![Graph showing the relationship between degree of support for change and dominant culture.](image)
Figure 39: Degree of Support and Urgency Graphs - Modified
Figure 40: Rationalisation of Table 41 and Figure 3
Table 47: Modified Version of Table 41 (Identifying the Hows, Examples of initiatives that might help)

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Reduce Costs</th>
<th>Increase Flexibility</th>
<th>Reduce Waste</th>
<th>Increase Speed</th>
<th>Improve Quality</th>
<th>Supply Chain</th>
<th>Customer Focus</th>
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<td>Lean Manufacturing</td>
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<td>Hostile</td>
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</table>

Table 48: Modified Version of Table 44 (Change Process Options Guide)