Dedicated to

Willo

A Guiding Light

World Class Manufacturing: Implementation and Measurement in the Irish Automotive Rubber Mouldings Component Industry

This one volume thesis,
supervised by Dr Jim Whyte and Dr David Jacobson,
Dublin City University Business School,
Dublin City University,
is submitted in candidature for the award of Doctor of Philosophy.

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I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of PhD, is entirely my own work, and has not been taken from the work of others, save and to the extent that such work has been cited and acknowledged within the text of my work.

Signed: Sarah Ingle ID No: 94970505 Date: 20 Dec. 1999

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ABSTRACT

The main objectives of this thesis are to determine how and why world class manufacturing (WCM) practices are implemented, and to examine potential links between the introduction of these kinds of practices and performance measurement systems. There is theoretical and empirical evidence to suggest that WCM practices can be categorised into one or more of: total quality management (TQM), just in time manufacturing (JIT) and employee involvement (EI). Four different WCM implementation modes are also identified in the literature. Research in the areas of management control and performance measurement suggest that in order for companies to assess the benefit of implementing WCM practices, there is an increasing necessity for them to use both financial and non-financial measures effectively. This literature thus provides the basis for the theoretical framework used in the study.

The complete rubber mouldings segment of the Irish automotive component manufacturing industry is examined using a case-based design, to address both the initial research questions and the research propositions developed following literature reviews. The empirical data includes information from: preliminary interviews in academia, consultancy and government agencies; in-company interviews; plant tours; and a performance measurement questionnaire administered to three management levels in each of the five organisations studied.

The findings suggest that firms can utilise both a main and secondary mode to introduce WCM practices, and that the overall implementation mode used is both affected by and affects other variables. This thesis contributes to research in a number of ways. First it provides an in-depth study of WCM practices and performance measurement in an Irish context. It also develops and applies a classification of the implementation modes used to introduce WCM practices. Finally, it identifies internal and external factors associated with both the introduction of WCM practices as well as the performance measurement system utilised.

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ABBREVIATIONS

ABT	An Bord Tráchtála
ABC	Activity Based Costing
AMT	Advanced Manufacturing Technology
ASA	Automotive Supplier Association
CK	Complete Kit
CKD	Completely Knocked Down
DM	Deutschmark
EI	Employee Involvement
EVA	Economic Value Added
GPM	Global Performance Measures
ICTU	Irish Congress of Trade Unions
IDA	Industrial Development Authority
IPC	Irish Productivity Centre
ISO	International Standards Organisation
JIT	Just-in-Time Manufacturing
LHS	Left Hand Side
MB	Mercedes Benz
MID	Moulded Interconnect Device
MNC	Multi-National Corporation
MRP II	Manufacturing Resource Planning
NSAI	National Standards Association of Ireland
OEM	Original Equipment Manufacturer
PMQ	Performance Measurement Questionnaire
RHS	Right Hand Side
SPC	Statistical Process Control
TOC	Theory of Constraints
TPM	Total Preventive Maintenance
TQM	Total Quality Management
TUV	German ISO auditors

UCD	University College Dublin
UCG	University College Galway
UK	United Kingdom
US	United States of America
VAG	Volkswagen Automotive Group
VAVE	Value Analysis Value Engineering
WIP	Work in Progress
WCM	World Class Manufacturing

GLOSSARY

An Bord Tráchtála	The government funded agency An Bord Tráchtála (ABT - The Irish Trade Board), was set up following a merger of the Irish Export Board and the Irish Goods council. Its main aim is to help Irish firms develop sustainable markets of both a domestic and international nature. It is now part of Enterprise Ireland.
Enterprise Ireland	The mission of Enterprise Ireland is to help Irish companies grow their sales, exports and employment. It is a government body that helps build competitive advantage through innovation, training, marketing and technology. It comprises Forbairt (see below), Fás (Training and Employment Authority) and ABT (see above).
Forbairt	This government funded agency was established to aid the development of Irish firms in the business community and to provide a range of technological and scientific services for enterprises in Ireland.
IDA Ireland	The objective of this government funded agency is to create employment in Ireland by influencing foreign companies to set up or expand their existing plants in Ireland.
ISO 9000	This is a series of international standards for quality management systems. Approved bodies provide registration and auditing services for organisations where the quality management system conforms to the ISO 9000 standards.
ISO 9002	The international standard for quality management systems for organisations undertaking manufacturing distribution and service but not design.
QS 9000	An automotive standard for quality management systems developed by Ford, Chrysler and General Motors.

1. INTRODUCTION

1.1 CHAPTER OVERVIEW

The research presented in this thesis is based on a study of five firms which make up the complete rubber mouldings sub-sector of the Irish automotive component manufacturing industry. The main objective of this chapter is to introduce the research topic and explain the aims of the work.

A general introduction to the themes addressed in the study is followed by an explanation of the research objectives. A review of what constitutes research is also undertaken, and the link between academic theory and actual practice explored. An outline methodology of the main stages in the research process for this thesis is then provided. An examination of the theoretical foundation that underpins the study follows, and this is discussed in relation to the methodological literature.

The theoretical framework utilised in the research is based within both world class manufacturing (WCM) and management control literatures, and in particular deals with the increasing realisation of the need to balance both old, financial based measures with new, quality and customer oriented measures when WCM practices are being implemented. The three research questions developed in order to address the overall objectives are presented at the end of this section. An examination of the study's contribution to theory and practice is then

discussed in order to highlight the need for the work. The chapter concludes with an overview of the thesis structure.

In accordance with University regulations, listed below is the author's published work prepared and presented during the course of the research:

2000, (Forthcoming) 'Realigning Performance Measures: Case Studies in Irish Industry'. *International Journal of Business Performance Management*, Vol.1, Part 2.

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1999, (with David Jacobson) 'Approaches to TQM Adoption in an Irish Context'. *4th International Conference on ISO 9000 and TQM*, Hong Kong Baptist University, 7-9 April.

1998, 'Performance Measurement Questionnaire: An Application to the Irish Automotive Component Industry', in Neely, Andy D. and Daniel B. Waggoner (Eds). *Performance Measurement - Theory and Practice* Vol. 2. Cambridge University: Centre for Business Performance.

1998, 'Performance Measurement: Changing Strategies in Irish Industry'. *Fifteenth Irish Manufacturing Committee Conference: Manufacturing Strategies for Europe*. University of Ulster at Jordanstown, 4 Sept.

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1996, 'World Class Manufacturing and Quality Standards: Survival Imperatives in the Irish Automotive Component Manufacturing industry' *Quality Management Research Symposium*, RTC Sligo, Nov.

1.2 INTRODUCTION TO THE RESEARCH

The genesis of this research lies in the author's professional experience as a senior production engineer in Irish manufacturing industry. As a member of a WCM pilot steering committee, she introduced WCM practices into organisations committed to improving their processes and overall performance. One of the issues that came to light during this time was the seeming inability of managers to address in a timely fashion the rate at which employees at all levels were responding to the changes introduced. This was particularly the case in terms of the performance measures utilised. Senior management in the main plant of the organisation were still using the cost and direct labour oriented figures which were not as relevant following the introduction of the new practices. This anomaly set the scene for the research presented in the thesis.

1.2.1 Industrial Overview

Due to increasing competition and globalisation, organisational and other practices in industry are changing worldwide and are adapting to the new customer oriented climate where quality products are delivered on-time, every time. Companies are now not solely being measured on how cheaply they can produce; quality levels and delivery performance are also important considerations. According to Schonberger 'earthquakes, tremors and aftershocks' (1990, p.1) have occurred in manufacturing industries. This analogy refers to the major innovations

within production organisations that have become the focus of management attention during the last twenty years. These changes have become more urgent as the demand for higher quality of the completed product from *external* customers has brought with it a need for extensive improvements and improved quality in all *internal* processes.

The requirement for increased quality performance and customer satisfaction has led to the utilisation of new philosophies such as WCM, total quality management (TQM), just-in-time manufacturing (JIT) and employee involvement (EI). The most recent developments involved in these kinds of programmes emphasise the importance of performance measurement within an overall context of management control (Schonberger, 1996; Ronen and Pass, 1994: Otley, 1994; Kaplan, 1990).

There has also been an increasing realisation that due to factors such as increasing competitive demands and the development of globalisation, traditional, solely financial-based measurement systems that encourage a short-term focus are fast becoming at best, inappropriate, and at worst detrimental to business (Johnson and Kaplan, 1987; McNair et al, 1989). More recent literature suggests that it is necessary to utilise a balanced performance measurement system that reflects the importance of areas such as quality and customer satisfaction (Kaplan and Norton, 1992).

1.2.2 Research Objectives

The aims of this thesis are to investigate how and why WCM practices are implemented and to examine potential links between the introduction of WCM practices and performance measurement systems. There are overlapping themes between both the WCM and performance measurement literatures and that of management control.

The link between WCM and management control is an important one, and stems from the integral role that the notion of 'continuous improvement' plays in a WCM environment. The objective of implementing WCM practices is not just to introduce techniques and processes in order to install a checklist of items; the overriding goal is the attainment of improvements in many operational and other processes and procedures, in areas such as quality, reliability and customer satisfaction.

The research objectives will be addressed using findings from the Irish automotive rubber mouldings component sector. There are two main reasons why firms in this area were chosen for study. First, it is a sector based in an industry in which the attainment of superior performance and competitiveness is of utmost importance. Bursa et al (1997, p.1) state: 'one thing is certain: to remain competitive, [automotive] companies today must grow or die'. It will thus be useful

for the industry as a whole to determine how the firms in this study both survive and increase competitiveness.

Second, it is an industry in which rapid changes are occurring from both organisational and technological points of view. Because automotive component companies supply their products to demanding and price conscious car producers, they have to be able to concentrate on reorganising their manufacturing facilities on an 'increasingly *lean* and efficient basis, with the objectives ... of reducing costs, increasing flexibility and interacting and cooperating with their suppliers' (Sleigh, 1993, p.2). An examination of how and why these organisational and technological changes are taking place in an Irish context is again important for both the sector and the industry.

As top management commitment is a prerequisite for WCM to succeed in an organisation, the level of analysis in this research will be at the firm level, as opposed to employee or industry level. The emphasis is on the overall company strategy, planning, implementation and control decisions made, and how these are ultimately linked.

1.3 OVERVIEW OF RESEARCH IN GENERAL

Research is an activity that is difficult to define as it encompasses many areas including beliefs, choices, aspects and dimensions. Wolcott (1990, p.31) believes that research should be thought about as 'problem setting rather than problem solving'. This is a reasonable argument as

so much of a researcher's efforts have to go into designing the research hypotheses, outlines and methods of data collection before even one piece of field work takes place.

Carrying out research may appear to be the undertaking of a logical process of rational actions. In reality however, Pettigrew (1985, p.222) believes that research is 'clearly a social process, not merely a rationally contrived act ... [and] is more easily characterised in the language of muddling through, incrementalism, and political process than as rational, foresightful, goal-directed activity'. While it may seem surprising, this is what actually happens. Small steps are taken, one at a time, sometimes in the wrong direction, in order to obtain information. Pettigrew (1985, p.223) ultimately regards research as 'a craft process, not merely as the application of a formal set of techniques and rules'.

It is also important to examine closely the meaning of research, especially when doing studies in firms. This is because the meaning 'is crucial to making sense of the broader questions of the relevance of research for theory and practice' (Goodman, 1985, p.327). Preece (1994, p.18) places a particular emphasis on academic research and believes that:

> Such research is conducted within a system of knowledge or understanding, but it should always be probing or testing that system. It aims towards increasing a common heritage or knowledge, though sometimes it will fail. The increase of knowledge may be something entirely new or original or, more commonly, it may consist of checking, testing, expanding and refining ideas which are themselves still provisional. In particular, research should continually question the nature of knowledge itself, what it is and how it is known.

Creswell (1994, p.51), however, supplies a more pragmatic view and states that the definition of a research study is 'one that advances a research question and reports data to answer the question'. The most important issue here is the development of the research questions and propositions, as without a concrete set of propositions to examine, any study undertaken will lack a coherent focus. The research propositions guiding this study are developed in chapters two and three.

1.3.1 Creating a Link Between Theory and Practice

Adams and Schvaneveldt (1991) provide another way of looking at the research process. They believe that 'research in any field seeks to generate new information or knowledge that, in turn, can be applied to solve problems, improve the quality of life and provide a better understanding of conditions in a field' (Adams and Schvaneveldt, 1991, p.12). This means that the results of a well conducted study can provide useful information for both academics and practitioners and build on the work that has already been carried out.

As one of the objectives of this research is to try and forge a link between theory and practice, this is a pertinent point. The aim here is to provide useful information for the participants and organisations involved in the study, a goal which is supported by several authors (Lawler et al, 1985; Pettigrew, 1985; Goodman, 1985). Lawler et al state that there are two standards that any research project must meet: 'the project must help practitioners understand organisations in a way that will improve practice, and it must contribute to a theoretically and scientifically useful body of knowledge about organisations' (1985, p.2). These in fact are the overall goals of this study, as the results generated (summarised at the beginning of chapter eight), can be used to assist managers in improving their firms, as well as adding to academic theory.

1.3.2 Research Methodology

The overall methodology used to carry out the research closely follows the system outlined by Flynn et al (1990, p.254). These authors recommend the following steps which are utilised in this thesis:

- Establish the theoretical foundation
- Select a research design
- Select and implement a data collection method
- Analyse data and present work.

The establishment of the theoretical foundation is discussed in the next section, while the selection of the research design and description of the

data collection method are described in chapter four. Analysis of the data takes place in chapters six and seven.

1.4 THEORETICAL FOUNDATION

As will be shown in chapter two, certain gaps can be highlighted in the WCM literature. Many authors are trying to explain what is involved in WCM and similar programmes and are attempting to explicate the techniques and characteristics involved. Very few, however, have been successful in fitting their descriptions into new or existing theories. This research study aims to address the lack of theory in order to develop a more theoretical base for organisational improvement techniques.

1.4.1 Theory Verification and Theory Building

According to Flynn et al (1990, p.253) who have written on empirical research methods in operations management, 'theory provides the foundation for all scientific research'. They also believe that there are two ways in which the theoretical foundation can be established, ie by *theory verification* or *theory building*.

Theory verification is the approach used where the focus is on testing the hypothesis rather than analysing its origin. Using this approach the hypotheses are constructed before the research starts and then tested when the data are obtained. Theory building studies, however, use information in different ways and the starting point is based on propositions, assumptions or problems rather than definite hypotheses.

Information is collected in order to help define the propositions, and thus they are grounded in data even before the actual theory building begins. Flynn et al (1990, p.256) note that 'the value of theory building lies in its permitting a wider range of observation and inquiry than the more traditional theory testing does'.

This study utilises the theory building approach, as the research propositions were set down following preliminary interviews and literature reviews. The information collected during this research period was used to clearly define the propositions and ensure their relevance to the industry being studied.

1.4.2 Deduction versus Induction

The use of deductive methods is attractive because if the argument is at all valid then the conclusion is certain (Preece, 1994). The difficulty with this approach though, is that the conclusion cannot provide any new information, it can only supply ideas that are already contained in the evidence required to generate the deductive hypotheses. Induction on the other hand requires a 'creative leap'. It means that new ideas are needed to reach the conclusion, and extra evidence can support the conclusion. One way to solve any intuitive or imaginative difficulties that may arise with induction is to use the 'hypothetico-deductive' method, a process which is used in this thesis at the analysis stage. This method links deduction and induction by a process of testing;

'induction provides ideas, deduction is used to test and to confirm or reject ideas, wholly or in part' (Preece, 1994, p.60).

1.4.3 Exploratory versus Explanatory

Before designing the research a decision has to be made about the overall strategy and what the most useful data collection methods are. Marshall and Rossman (1995, p.41) suggest that there are four different purposes for undertaking a study: exploratory, explanatory, descriptive and predictive all of which are employed here. Each of these asks different kinds of research questions, employs different strategies (even though there is often considerable overlap between them (Yin, 1994)) and has correspondingly different ways of gathering information.

This study is both exploratory and explanatory in nature as it is difficult to completely separate the two methods. As Ryan et al (1992, p.116) put it, 'the distinction between exploration and explanation is rather ambiguous'. On the exploratory side, a little-studied segment of Irish industry is examined in detail in order to identify relevant issues for a firm's survival and continuing competitiveness, and to produce generalisations about the kinds of WCM and performance measurement practices in place. On the explanatory side the research will attempt to explain the reasons for the practices being introduced and to draw conclusions regarding the link between the introduction of WCM

practices and the kinds of performance measurement systems utilised in the firms examined.

The descriptive element of the research is also important as description is 'the foundation of knowledge' (Preece, 1994, p.29). As in this thesis, the descriptive work can then be used to construct an explanation or be fitted into an explanatory framework (Maxwell, 1996). Identifying relationships between different variables will also allow a certain level of prediction to take place, although care will be taken in the study not 'to assume that all observed relationships, or correlations, are causal' (Preece, 1994, p.30).

1.4.4 Qualitative versus Quantitative

The final research design selected for this study is a case-based[1] approach. The findings are based on a structured in-depth interview carried out with each general manager as well as a questionnaire administered to employees at three management levels in all of the companies involved. Combining qualitative and quantitative approaches facilitates the acquisition of both in-depth information and survey data. The results of the qualitative and quantitative investigations allow the research propositions to be addressed in a rich and rigorous way, and serve to guide clearly the final conclusions.

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[1] Justification for the case-based approach is provided in section 4.2.

This combination of methods is one that has wide agreement. Researchers such as Bryman (1988), Burgess (1984) and Denzin (1989) suggest that the best way to carry out research in areas where people are involved, is to use a combination of qualitative and quantitative techniques. Bryman (1988, pp 126-127) argues that:

> ..... when quantitative and qualitative research are jointly pursued, much more complete accounts of social reality can ensue ... the rather partisan either/or tenor of the debate about quantitative and qualitative research may appear somewhat bizarre to an outsider, for whom the obvious way forward is likely to be a fusion of the two approaches so that their respective strengths might be reaped.

Simon et al (1996, p.33) assert that 'the use of both quantitative and qualitative techniques to obtain a clearer picture of reality makes sense, and answers many of the questions raised by the critics of traditional empirical research'. Yin (1994, p.9) also believes in the strength of using more than one strategy in a study and states that 'the various strategies are not mutually exclusive'.

The previous arguments have helped contribute to the decision to combine qualitative and quantitative methods in this study. A use of either quantitative or qualitative methods alone in the thesis would not have been appropriate due to the nature of the research questions and propositions. Relying solely on survey questioning would have resulted in a lack of in-depth information on why and how changes in WCM practices and performance measures were made. On the other hand, a complete emphasis on interview and observational methods would have

meant that the overall view from employees at different levels in the organisation would not have been taken into account, resulting in only a top-level view of the firm. The qualitative data in terms of interview and plant findings are strengthened and confirmed by the results from the performance measurement questionnaire (PMQ) which surveys all managers and supervisors in each firm studied.

1.4.5 Summary of Research Process

A multi case-based approach is used in the study to make comparisons between five small to medium sized, Irish-based multi-national companies, operating within the same sub-sector of a highly competitive industry in terms of their histories, structures, strategies, parent company/supplier/competitor relationships, technical/organisational processes, and performance measurement systems.

The case-based approach is used in order to obtain detailed information regarding the initial impetus, extent of implementation and resulting outcomes of the WCM process within each of the organisations examined. This would not have been possible with a survey methodology alone. Evidence from interviews, plant tours and questionnaires in the rubber mouldings sub-sector of the Irish automotive component manufacturing industry is used in order to determine both the extent of the implementation of WCM practices and the overall types of performance measurement systems adopted in the sub-sector studied. The influence of customers and parent companies is

explored, and the kinds of performance measurement systems in plants aspiring towards WCM analysed.

1.5 JUSTIFICATION FOR CHOICE OF THEORETICAL FRAMEWORK

The theoretical framework chosen is centred within the literatures of both WCM and management control. This is an appropriate framework as there are many commonalities that can be drawn between these two areas.

First, as with the successful implementation of WCM, there are several steps that have to be taken before a new performance measurement system can be implemented. Lewis and McFadyen (1993, p.25) state that the prerequisites for successful change in performance measurement are: need to change, clear shared vision, new measures, reflecting new requirements, provision of resources, recognition and rewards, structured process. This list closely parallels the environment that exists before implementing WCM practices, thus providing a starting point for an examination of the linkages between the two topics.

The WCM and management control literatures have also developed in similar ways. As will be discussed in chapter two, the fundamental basis of the rationale behind the implementation of WCM practices is the recognition of the importance of a wide range of manufacturing and organisational parameters in today's global and competitive environment. These variables include emphasis on major areas such as

quality, customer satisfaction and flexibility. This recognition is mirrored in the evolution of the management control literature, which, as will be examined in chapter three, moves from an analysis of behavioural aspects of management control in the 1970s (Hopwood, 1974) to the development of the balanced scorecard (BSC)[2] in the 1990s (Kaplan and Norton, 1992).

A clear analogy can also be made between 'traditional' versus 'world class' manufacturing systems and traditional versus 'balanced' management control systems, further strengthening the case for the framework chosen. As Kaplan and Norton (1992) have stated, traditional financial based measurement systems use a controlling methodology whereby actions are first specified to employees and then measured. This can be likened to a traditional manufacturing process or 'push' system where work is pushed onto the next workplace regardless of what is required at that station. In a similar fashion, balanced measurement systems can be compared to 'pull' manufacturing systems such as those utilised in kanban[3] or JIT systems. A strategic

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[2] Chapter four includes a further examination of the balanced scorecard.

[3] The word *kanban* is Japanese for 'card'. Under a two-bin kanban system, operators send requests for parts to stores or other supplying operations when they have used up one bin of components. Stores or the internal suppliers pick or manufacture the parts required and send them to the requesting operator. The advantages are that work in progress does not build up at any work station and parts are only made available as and when required. This system results in a considerable reduction of the amount of buffer inventories circulating on the factory floor.

methodology is utilised in this case where objectives are specified by management, but the methods of achieving the goals are decided by the employees themselves. In other words, measures are adopted by the workforce according to the available resources as well as the prevailing restrictions imposed by a constantly changing environment.

Finally there is a strong link between the central issue of balance in measurement in manufacturing organisations and a firm's overall objectives. As will be further discussed in chapter three, within the accounting and management control literature over the last few decades, there has been a persistent theme that examines the increasing level of dissatisfaction with measurement systems based solely on 'old' cost and financial oriented indicators. There is also a further realisation of the necessity to achieve balance in measurement in terms of a combination of both 'old' and 'new' measures (ref. sections 3.6 and 3.7).

The work in this area culminated in the development of the balanced scorecard previously mentioned. The BSC was designed by Kaplan and Norton (1992) so that firms could implement a performance measurement system which does not rely simply on financial indicators, but includes non-financial measures as an important part of the overall system. They warn however that the best scorecard will not just have a selection of both financial and non-financial measures. The scorecards that actually assist in competitiveness and increased performance will be

derived from the firm's overall strategy. How the conclusions from this study reflects the underlying principles of the BSC will be addressed at the end of the thesis.

1.5.1 Research Questions

Three research questions are used as a starting point for analysis. These questions were developed in order to examine the issues raised from both the research objectives addressed in section 1.2.2, and the theoretical foundation just discussed.

1. Why and how are WCM practices implemented in Irish based multi-national automotive component manufacturing companies?
2. What is the link between the particular implementation mode used to adopt WCM practices and external relations, internal relations and performance outcomes?
3. How does the introduction of WCM practices affect the overall performance measurement system?

In order to answer these questions, a number of propositions are developed during the literature reviews presented in chapters two and three which examine in detail the issues involved.

1.6 SIGNIFICANCE AND CONTRIBUTION OF THIS STUDY

There has been little or no substantial research carried out in Ireland on either WCM implementation or performance measurement (Jacobson, 1996), and none at all linking the two. This study is therefore important as it addresses the need for this kind of research in an Irish context.

There are four main areas where the work presented in the thesis provides a significant addition to knowledge. The research:

1. Addresses gaps in the WCM literature
2. Investigates possible linkages between the introduction of WCM practices and the corresponding performance measurement system utilised
3. Examines a previously unresearched segment of Irish manufacturing industry comprised of non-indigenous firms with the same parent nationality
4. Applies for the first time a validated research methodology to a sector of Irish industry.

Each of these areas is now discussed, and will then be readdressed in the final chapter.

1.6.1 Gaps in WCM Literature

In common with other business related research, many of the studies that have been carried out on WCM are focused on the implementation of change programmes in companies (Vrakking and Mulders, 1992; Oliver et al, 1994; Motwani et al, 1994; Taninecz, 1997). From an academic point of view, these and other studies are weak as they have very little theory behind them (Powell, 1995). If this is the case then it means that practitioners are not waiting for theory but are designing descriptive methodologies in order to implement various techniques and also applying new tools to their own situations as and when they are found to be appropriate.

This is an important point as the main objective of this thesis is not to arrive at a definite and definitive conclusion regarding WCM as a holistic programme. Rather, the aim is to examine the areas around the topic so that the influence of different variables can be explored. During the analysis of the research findings the emphasis is therefore on the implementation of WCM *practices*[4], not WCM as an entire initiative. The work presented in chapter two further contributes to the development of WCM in an academic context by analysing the issues of differing terminology and lack of theoretical rigour as well as bringing together literature that indicates the existence of differing types of WCM implementation modes.

1.6.2 Link between WCM and Performance Measurement System

When WCM practices are introduced in a firm, continuous incremental change occurs which makes it difficult for financial-based control systems to keep in step. As Otley (1994a, p.298) puts it: 'The context and operation of contemporary organizations requires flexibility, adaptation and continuous learning to occur, but such characteristics are not encouraged by traditional control systems'. As already discussed, the rise in importance of using a balance of both financial and non-financial measures has been encapsulated in the seminal work carried

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[4] A discussion on WCM practices takes place in section 2.3.1.

out by Kaplan and Norton on the balanced scorecard (1992, 1993, 1996a, 1996b). These authors highlight the failure of traditional measurement systems based almost entirely on financial results to respond to changes in the manufacturing environment, and they believe that:

> Today's management accounting systems provide a misleading target for managerial attention and fail to provide the relevant set of measures that appropriately reflect the technology, the products, the processes, and the competitive environment in which the organisation operates (Kaplan and Johnson, 1987, p.3).

There is however anecdotal evidence to suggest that practices in organisations have begun to take account of the changing environment (Otley, 1994), but this has not yet been shown empirically in any detail. The last point ties in with a gap identified by Euske et al (1993). They state that 'to date little empirical work has been performed in this area to determine to what extent companies are actually changing their measurement process in response to advanced management practices' (Euske et al, 1993, p. 276). The findings from his thesis will go some way towards redressing the lack of empirical information in this regard.

One of the main aims of the research is to guide the formulation of conclusions linking the areas of WCM implementation and performance measurement systems. In general there has been very little research carried out on the kinds of performance measurement systems utilised in Irish firms (Clarke and Toal, 1999). However, two recent studies have found that management accounting practices in Ireland are not taking

into account the need to balance financial with non-financial measures, and accountants appear not to see shortcomings in their established measurement systems (Clarke and Toal, 1999; Pierce and O'Dea, 1998). It will be interesting to determine whether the focus of the sector under examination in this thesis is also on financial measures, and whether the results of the above studies are mirrored during the examination of the research findings. Also, as there has only been tentative work exploring the issues surrounding both the introduction of new organisational practices and changing performance measures in Ireland (Woodcock, 1994)[5], this study will thus go some way towards filling that particular gap.

Finally the issue of organisation is an important consideration. Otley (1994a) for example believes that general approaches outlined in the literature have never applied as fully to smaller firms. As the companies examined in this study are small to medium-sized by Irish comparisons, and small by international comparisons, the research presented here will contribute to the growing body of knowledge on this type of firm.

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[5] Woodcock found that although Irish firms are adopting TQM, JIT and advanced manufacturing technology practices, this does not appear to be translated into a revision of their management accounting practices.

1.6.3 Irish Automotive Component Industry

There has been no research carried out on the industrial segment examined in this thesis - the Irish rubber mouldings automotive component industry - so the work presented here fills a large gap in the Irish context. There has been some comparative research however carried out on the Irish automotive component industry as a whole (Wells and Rawlinson, 1994), as well as a few dissertations completed as part of Masters degree programmes (Breslin, 1993; O'Dowd, 1991; McMonagle, 1990; Mooney, 1989). These latter research projects although interesting in their own right, are not undertaken in any depth. Neither do they study any particular sub-sector in detail as has been done in this study.

The work presented here is also significant from a general Irish perspective. Insights into the strategic planning process with regard to the extent of changes in manufacturing and measurement in multi-national firms operating in Ireland are obtained, and some generalisations that can be addressed by practitioners are thus proposed in chapter eight. Finally, the research is also important with regard to the homogeneity of the parent nationality of each of the multi-national firms under consideration. There is little such research that examines the behaviour of subsidiaries and the nationality of parent companies in Ireland. This point will be further addressed in chapter four.

1.6.4 Research Methodology

The thesis involves the use of a Performance Measurement Questionnaire (PMQ) developed by Dixon et al (1990). Although this PMQ has been validated by research work in the United States and elsewhere (Ghalayini et al, 1996; Dixon et al, 1990), it has not had a wide usage and has never been administered in Ireland. In this research, further analyses of the PMQ have been carried out other than those used by the original authors. These were developed to address, and verify where appropriate, some of the research propositions using quantitative data. The overall conclusions are thus strengthened by the use of the PMQ. The original analyses developed by the authors were also carried out and used as the basis of a performance measurement report on each firm. These individual reports were presented to each general manager as a gesture of appreciation for their input and commitment to the study.

1.7 THESIS STRUCTURE

The work carried out in this thesis is structured around providing answers to the three research questions presented in section 1.5.1. The presentation of the research work undertaken to address these questions is divided into the eight chapters which make up the thesis. In this opening chapter the overall topic is introduced and the research objectives outlined. The theoretical framework utilised is also explained.

An overview of the literature relevant to the research is contained in chapters two and three. This deals with the areas of WCM, manufacturing strategy, management control and performance measurement. These chapters are central to the development of the arguments in the thesis as within them the background to the literature in each area is explained, and the difficulties arising out of these bodies of work are demonstrated. The review of the associated literature also made it possible to identify certain gaps, such as the lack of an agreed WCM definition and model, and the absence of consensus on an appropriate performance measurement framework for manufacturing organisations. The theoretical framework developed following the examination and analyses of the two literatures is summarised at the end of chapter three. The research propositions generated are presented alongside the original research questions which together provide an analytical framework to address the empirical findings.

The case-based methodological approach utilised in the study is discussed in chapter four. This is followed by an examination of the choice and justification of the chosen study cohort, and a detailed analysis of the steps involved in the research process is then provided. Chapter five provides an introduction to the sector examined in the research and also briefly outlines the major features of each of the companies studied.

The research propositions are addressed in chapter six by reference to the empirical evidence collected. This information is based on data obtained from in depth-interviews, within-interview questionnaires, plant tours and multi-level responses to a performance measurement questionnaire (PMQ). The case study information for all of the companies studied are thus presented not in terms of a traditional narrative for each firm, but in terms of each proposition. This is a method which is acknowledged by Yin (1994, p.135) as having 'advantages that are potentially enormous'. The reason for this is because each research issue can be separately examined by reference to all of the cases under consideration.

The results of the propositions are further analysed in chapter seven in the context of the original research framework, and a final model based on the empirical findings is developed. Chapter eight contains a discussion of the overall results which includes statements of the main arguments concluded in the thesis, chapter summaries, contributions made to literature and practice, and indications for future research.

2. WORLD CLASS MANUFACTURING

2.1 CHAPTER OVERVIEW

The purpose of this chapter is twofold. The concept of world class manufacturing (WCM) is first introduced to provide a context for the later discussions, and an explanation why WCM practices are implemented in many companies world-wide is provided. An examination of reasons why WCM does not always succeed in improving performance in manufacturing organisations is also presented here to deepen the analysis. A critical evaluation of the WCM literature is then undertaken to determine the underlying theories arising in this area, as well as identify gaps in the literature in order to develop propositions that will provide direction for the empirical research.

2.2 INTRODUCTION

WCM is a term that was first used by Hayes and Wheelwright (1984) to define[1] firms that 'achieved a global competitive advantage through use of their manufacturing capabilities as a strategic weapon' (Flynn et al, 1997, p.671). It is a kind of philosophy that is perceived in the literature as being an increasingly relevant and necessary element of manufacturing organisations. Girifalco (1992, p.52) for example

[1] A further discussion on definitions of WCM is provided in section 2.3.1.

believes that adopting the principles involved in WCM can actually help create change in an organisation, which is a benefit in itself:

> Equally important, however, is that this change typically leads to identifying other productivity related issues, such as employee apathy, absenteeism, and broken lines of communication. It also fosters a commitment to uncover and address the barriers that prevent a company from becoming world class.

Thus, according to Girifalco (1992), WCM can provide real and measurable benefits to improve an organisation's overall organisation and competitive advantage, and also allows a means of identifying areas that are limiting the company while promoting a climate conducive to addressing these issues. He does not, however, explain the underlying approaches to implementing WCM, which, as will be shown later is a weakness in the literature as a whole.

There are difficulties however in implementing WCM and similar programmes, not least that of the management commitment required. Kearney's (1997) seven overlapping elements of WCM provide a very clear outline of what is needed to install WCM in an organisation, but most firms would not be able to get past his first step of *leadership*.

> If companies are to achieve fundamental changes, not only do they need leaders who can manage the numbers, they also need leaders who can get organizational members to embrace the change process and exert energies to achieve the established goals ... Those in leadership who still think they can use management techniques to implement world-class manufacturing practices are on a journey to failure (Kearney, 1997, p.68).

It is this requirement for top-level commitment that in many cases causes the first stumbling block. Powell (1995) has also found that it is not the individual items such as statistical process control (SPC), or the setting up of pilot projects that determine the success of a particular programme; it is the extent of top management commitment and employee involvement that actually ensures improvements in the organisation.

2.2.1 Reasons for Implementing WCM

It is important to consider why companies choose to implement WCM practices, as their goals or objectives will ultimately affect their strategy and thus their choice of organisational and other processes. MacDuffie and Krafcik (1990) identified from their research that it is appropriate to view WCM as a genuine resource leading to competitive advantage. Collis (1994, p.151) also finds that organisational capabilities can 'meet the conditions for the existence of sustainable competitive advantage'. This view is shared by Powell (1993) as he found that the capability of an organisation to align its strategy formulation with its structure and the environment has been shown to provide major benefits. A successful WCM programme implemented in an organisation constitutes such a capability, as the processes and measures used are constantly changing to adapt to environments and markets. Rommel et al (1995) in a detailed study of 40 companies, found that there was a strong correlation between corporate success and the overall organisational practice of "simplicity" which is one of the underlying principles of

WCM (Schonberger, 1990). The main reasons provided in the literature for implementing WCM practices are summarised in the following sections.

2.2.1.1 Global Competition

A recurrent theme in the decision making process about whether or not to implement WCM is that of competition. 'To be competitive is essential for survival in today's global business environment' (Jacobi, 1991, p.19). What companies are finding now is that maintaining or persisting with traditional strategies such as those dedicated towards inspection and rejection is no longer an option. 'Firms that feel the heat of global competition - as well as those that simply want to keep a leg up on domestic rivals - have been putting their products, their processes, their people, and their management systems under a microscope to see how they measure up against the best companies around the globe' (Sheridan, 1990, p.36). It can however be argued that imitation is not necessarily the best form of defence, and firms must consider the best option for their particular situation and not just mimic what others are undertaking.

2.2.1.2 Changing Nature of Competition

Allied with the foregoing views, it has also been put forward that WCM is a necessary programme to have in organisations because the *nature* of competition is changing (Best, 1990). Although product price is still very important 'it is no longer the deciding factor ... increased

international competition has meant that customer requirements are changing rapidly and becoming increasingly stringent' (McCall, 1995a, p.15). Customers often now require more product variety, smaller quantities of product in more frequent deliveries, reduced production lead-times, increased quality and price reductions on an annual basis. Some of these needs can be met using techniques other than WCM: by holding more stock, allowing unlimited overtime or by setting up more supervision to try and increase output. It is arguable, however, that these methods will ultimately damage a company's long-term competitiveness.

2.2.1.3 Importance of Flexibility and Adaptability

There has also been a change in emphasis in the key areas of manufacturing over the last thirty years. Instead of critically examining how to *minimise* costs the focus is now on cost *elimination*, which means, among other things, discovering and eliminating the causes of inventory and quality problems. In the area of automation the new criterion for excellence is based not on how fast a production machine can run, but how easily and quickly it can be set up to manufacture different items (New, 1992). For a company to be able to concentrate on eradicating the root cause of problems and increasing technological and other flexibility, there needs to be a willingness to learn, an ability to grasp new concepts and adapt them to the new environment. The world of manufacturing is constantly evolving and it is difficult to forecast what will be important in years to come. The only thing that

seems to be predictable is that 'the essence of future success lies in having an organisation which can *self-change* and *self-improve* continuously' (New, 1992, p.22). Thus, implementing an overall organisational process such as WCM may enable organisations to carry out the changes required in a systematic way using methods appropriate to their prevailing internal and external environment.

2.2.1.4 Customer Requirements

Finally, according to Sandelands (1994), the new market environment now requires companies to be responsive to customer requirements, and oriented towards end-user markets, as well as being open to the installation of flexible manufacturing methods. He also believes that 'simplicity and discipline are the keys to flexibility' (Sandelands, 1994, p.9). What this means is that if the main elements of a certain product, say a car, such as its body shell or frame are the same over a range of models, both the purchase of capital equipment and the development of production processes are simplified. In practice, the manufacturer should be able to respond to customer requests for variety by providing cosmetic variations, such as paintwork or upholstery, as well as more technical details, such as different engine sizes and corresponding performance levels.

Following analysis of the foregoing themes, it can be concluded there is general agreement in the literature that the main reasons given for WCM adoption are the changing natures of both customer requirements and

the competitive environment. As will be discussed in chapter six, this conclusion is one that is mirrored by the findings of the research presented in this thesis. The firms involved in the study all cite the increasing need for flexibility to meet new demands from both car manufacturers and end users, as well as the highly competitive nature of the automotive component industry as reasons for implementing changes in their organisations. As the following section shows however, WCM implementation is not an easy process. Leonard (1990, p.315) puts it thus:

> The shift of manufacturing from more traditional stances and responses to world class competition is not smooth, easy, or short. Experience shows that far-reaching and significant changes must be accomplished: first, in manufacturing; then, in how the corporation manages manufacturing; finally, in how manufacturing influences the corporation.

Ultimately, it will be the influence of the manufacturing divisions on the other areas of the corporation that will determine how competitive an organisation can be. According to Otley (1994a), the only kinds of companies that will survive are the ones that match their skills and competencies to the changing needs of customers, suppliers and shareholders.

The preceding discussions lead naturally to the development of the first proposition. This is formulated in order to determine whether the reasons given in the literature for implementing WCM practices are

confirmed in practice by reference to the empirical findings in this area addressed in chapter six.

P1.1: WCM practices are implemented in order to meet rapidly changing customer requirements and keep up with competition.

Other reasons for implementing WCM practices such as pressure from parent corporations or other bodies may emerge following the examination of the firms in the study.

2.2.2 Reasons why WCM is not Successful

The previous section has presented arguments indicating the efficacy of WCM practices, but there is a body of international research which indicates that many firms introducing WCM principles or related initiatives do not achieve the expected improvements in operating performance (Mathews, 1992; Wilkinson et al, 1993; Hill, 1993; Fuchsberg, 1993; Hayes and Pisano, 1994; Gunnigle et al, 1995; Powell, 1995). This literature suggests a number of reasons why attempts at implementing WCM practices are not always successful.

The first area considered is that some organisations are selective about what techniques they choose to install, and thus do not see the process as an overall change programme. This kind of 'cherry-picking'

approach[2] (Gunnigle et al, 1995; Jacobson, 1996) cannot achieve long-lasting and effective results especially if it is tried as a 'last resort'. Attempts to *save* a firm using WCM principles are very likely to fail. Hayes and Pisano (1994) have found that although increasing numbers of companies are trying to improve their competitiveness by implementing new processes and organisational practices, many of these efforts are not successful. The problem however is not in the practices themselves; the difficulty is that improving an organisation just with the processes and practices alone is 'not a strategy for using manufacturing to achieve competitive advantage' (Hayes and Pisano, 1994, p.77). These authors argue that if companies pin their hopes on one particular "best-practice" approach then they 'implicitly abandon the central concept of a strategy in favour of a generic approach to competitive success' (1994, p.77).

Another problem occurs in regard to the challenge that WCM practices pose to corporate cultures' (Roche and Gunnigle, 1995). Because the implementation of these kinds of practices often necessitates the introduction of changes in organisational structure, including increased autonomy for employees (Wilkinson, 1992), in many cases it becomes too difficult for management to install in a systematic fashion and thus piecemeal approaches are adopted. In regard to TQM and EI, some

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[2]The 'cherry-picking' of particular practices is further discussed in section 2.3.4.3.

research (Blyton and Turnbull, 1992; Geary, 1994; Gunnigle, 1994) has found that implementing TQM may result in increasing monitoring of employee performance which could produce a deterioration in employee relations, exactly opposite to the desired effect.

There is also debate on the issue of whether WCM and related initiatives actually do impact on employee involvement (EI) and empowerment. Some authors believe that they do in fact facilitate 'significantly increased levels of employee involvement through worker empowerment and mutual dependency' (Roche and Gunnigle, 1995, p.24). Others however have argued that in many cases only lip-service is paid to employee involvement practices, and in practice important decisions are made solely by management (Sewell and Wilkinson, 1992; Klein, 1989). This contrast in opinions reflects the difficulty there is with the theory surrounding the implementation of WCM practices, a topic which is further addressed in section 2.3.2.

Other authors (Porter, 1996; Voss, 1995) agree that there are difficulties with the assumption that 'best practices' are equally applicable and necessary in all firms. As Harrison (1998, p.399) puts it, the definition of WCM as a set of metrics and practices models 'a competitive environment which encourages companies to become similar to one another. Imitation, however, is a doubtful strategy for manufacturing strategy development'. The idea that 'best practice' does not necessarily translate into 'best performance' is not a recent one, though it would

seem to have been subsumed into much of the hype and fanfare of WCM and associated techniques. Skinner (1974) with his idea of a 'focused factory' stated that there was not 'one-best-way' for an organisation to operate, that companies must differentiate themselves in a number of ways based on their strengths and weaknesses. A more recent empirical study on TQM firms and their related performance also suggests that instead of merely imitating TQM procedures, 'firms should focus their efforts on creating a culture within which these procedures can thrive ... [rather than be] focused almost entirely on the TQM tools and techniques' (Powell, 1995).

In conclusion on this point, it seems that there is a weakness in the reasoning adopted in this area, and many firms appear to confuse the 'end' with the 'means'. Once they have quickly implemented a certain number of new initiatives such as SPC and have cellular manufacturing installed, some are confused and concerned as to why they have not achieved improved competitiveness and/or performance. Ultimately they have missed the benefits that can be obtained from a methodical evaluation of required objectives and adherence to carefully selected techniques in order to achieve those goals and obtain long-term benefits.

2.3 CRITIQUE OF WCM LITERATURE

As has been shown, there is agreement that the implementation of WCM principles can help the performance of an organisation. There are however counter indications regarding the success of WCM practices,

which have particular implications for Irish industry. A deeper examination of the literature leads to the identification of other criticisms and gaps as follows:

1. Lack of agreed terminology
2. Lack of theoretical rigour and definition
3. Drawbacks of main research methodologies utilised
4. Lack of debate on the overall approaches used to implement WCM.

2.3.1 Lack of Agreed Terminology

WCM is a manufacturing philosophy that appears to have as many different appellations as it has ways of being implemented. Terms such as JIT, kanban, group structure and logistics management are used interchangeably for WCM (Vrakking and Mulders, 1992), and Schonberger (1994b) has found additional terms in common use to describe it including TQM, JIT, *kaisen*[3], world class excellence and world class business. Other ways of describing this change process aimed at improving customer satisfaction and elimination of waste (Schonberger, 1986a) is *agile manufacturing* (Nagel and Bhargava, 1994) and *competitive edge vision* (Jackson and Frigon, 1996). There is very little attempt in the literature, however, to reduce the confusion and

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[3] Japanese term meaning continuous improvement.

distortion that this kind of random naming causes, and there has been nothing written that comprehensively addresses this issue.

One of the reasons for this lack of agreement is the involvement of many of the authors in this field with practitioners in industry. In each firm they visit there is a usual way of addressing the change practices taking place specific to that particular organisation, and so the diversity of programme descriptions in practice has led to the proliferation of terminology in the literature. The reason why individual organisations have different names for programmes, such as Motorola calling theirs *Total Customer Satisfaction* (TCS)[4], may be however because firms wish to differentiate themselves from their competitors, and if everybody else is adopting WCM practices then they might want to be perceived as carrying out original principles.

Another reason to explain the multiplicity of terms is the competitive nature of the academic environment. Womack et al (1990) in their comprehensive, seminal study of the international automotive industry, developed their concept of 'lean production' which in essence is very similar to the principles espoused by WCM. This work has been heavily challenged however, in particular by Williams et al (1992). The criticisms by these authors, however, did not address Womack et al's

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[4] Conversation with Quality Engineer in Motorola, Dublin, May 1996.

views on what were the variables that constituted lean production; what was criticised was the methodology and the comparisons and conclusions drawn.

Jackson and Frigon (1996) have also noticed problems with terminology particularly in connection with the area of employee involvement (EI). 'Among successful companies: some have improvement teams; some have work cells, or team advisors; some have steering councils; some have pilot projects. Some call the same elements by different names. Some companies have all these elements but do not know that this is what they are doing' (Jackson and Frigon, 1996, p.7). These authors thus further emphasise the difficulty there is in examining areas that are part of WCM as well as the whole concept itself.

The main problem that arises over this lack of clarification in practitioner terms, particularly because some of the issues involved are often intangible, is that it leads to a sense of misunderstanding rather than comprehension about what WCM actually is, and means that firms may just end up implementing practice after practice without actually understanding why they are doing it, and what results they expect to obtain. Therefore a clearer understanding of what is actually involved in any managerially imposed programme of change is necessary from both academic and practical points of view.

The preceding discussion highlights the difficulty of trying to define WCM and its associated practices. As indicated in chapter one (section 1.6.1), this study proposes not to define WCM as an entire and complete initiative, but instead views it as a set of practices that are firm and environment specific. The literature just reviewed is supportive of this argument although it is not explicitly stated.

There are many processes and practices described in the literature as being part of WCM. These include TQM, JIT, EI, TPM[5], simplicity[6], MRP II[7], waste elimination[8], complete kit[9] (CK), and theory of constraints[10]

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[5] Total preventive maintenance (TPM) is servicing and maintaining machinery, tools, and other equipment on a systematic basis, before they break down, so that they are available when required. Operators running the machinery are often involved in the process.

[6] Simplicity in the context of WCM means trying to ensure that all written procedures and documents, all manufacturing and other processes, in fact any work that is done is carried out in the simplest way possible to reduce errors and confusion and to eliminate waste of time, materials, and machine or human effort.

[7] MRP II is a formal and disciplined management process that plans and controls the total resources of a manufacturing business in order to effectively allocate limited resources to the most profitable opportunities and thus produce predictable performance.

[8] Waste elimination is part of the process of striving for simplicity, and is one of the underlying messages of WCM. If waste is eliminated as far as possible, then *value* is added to the product instead of expensive inspection, rework of faulty goods and disposal of bad products.

[9] The complete kit (CK) concept contains the view that no process or task should begin until all the items needed for successful completion of the job are ready and to hand. In the case of manufacturing this will include materials, drawings, tools and documentation.

[10] The theory of constraints (TOC) is a philosophy that enables managers to focus on a small number of constraints - those factors that impede organisational performance.

(TOC). However, following an extensive review of the relevant literature, it is concluded by this author that all WCM type practices can be included in the three categories of TQM, JIT and EI[11]. The following proposition was thus formulated:

P1.2: All WCM practices can be categorised as TQM, JIT and/or EI.

In addressing this proposition the following tentative definitions developed by the author are assumed:

1. TQM is a set of concepts and tools introduced in a firm to reduce defects, increase employee responsibility for quality and provide a focus for continuous improvement and customer satisfaction. Typical tools will include SPC and quality function deployment (QFD)[12].
2. JIT is a set of concepts and tools introduced in a firm to increase manufacturing flexibility, decrease buffer and final inventories, reduce cycle times and eliminate rework. Typical tools will include total preventive maintenance (TPM) and cell manufacturing[13].

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[11] For example Billesbach, 1991; Billesbach and Hayen, 1994; Bowman, 1989; Brower, 1992; Ciampa, 1991; Cleland, 1996; Corbett and Harrison, 1992; Garwood, 1990; Harrison, 1998; Ho, 1999; Hogg, 1990; Ingle and Jacobson, 1999; Jacobi, 1991: Kearney, 1997; Keegan, 1995; Keegan and Lynch, 1995; Mc Call, 1995a: Motwani et al, 1994; Oakland, 1993; Oliver et al, 1994; Powell, 1995; Ronen and Pass, 1994: Savageau, 1996; Schonberger (1986a, 1986b, 1990, 1992,1994a, 1994b, 1996); Sewell and Wilkinson, 1992; Sheridan, 1990; Spenchian, 1989: Wilkinson, 1992; Wilkinson et al, 1998.

[12] See for example Wilkinson et al, 1998.

[13] See for example Titone, 1994.

3. EI is a set of concepts and tools introduced in a firm to provide employees with more control over their job and their job performance, allow an interactive process of decision making between management and workers and utilise as fully as possible the skills and talents of all employees. Typical tools will include multi-functional teamwork and employee suggestion schemes[14].

In Table 2.1 the main elements of WCM according to some of the literature in the field are summarised.

AUTHOR	ELEMENTS OF WCM
Holpp and Wellins, 1989	TQM + JIT + EI + computer integrated manufacturing (CIM) + kanban
Schonberger, 1990	TQM + JIT + EI + TPM + simplicity
Jacobi, 1991	TQM + JIT + manufacturing resource planning + (MRP II)
Motwani et al, 1994	TQM + JIT + EI + waste elimination
McCall, 1995a	TQM + JIT + EI
Spenchian, 1989	TQM + JIT + EI
Ronen and Pass, 1994	TQM + JIT + CK + TOC
Hayes and Pisano, 1994	TQM + JIT + design for manufacturability (DFM) + team working
Keegan and Lynch, 1995	TQM + JIT + EI
Kearney, 1997	TQM + JIT + EI + leadership + waste elimination + product cells + standardization

Table 2.1 Elements of World Class Manufacturing

Following a review of these and related literatures as already discussed, it was concluded that there are many overlapping principles and philosophies involved in the different processes that are associated with WCM. Overlaps can be found for example in areas such as continuous

[14] See for example Cleland, 1996.

improvement, customer satisfaction, involvement of employees and reduction of waste. All of the authors cited in Table 2.1 state that TQM and JIT are integral elements to WCM, and most of them also include EI as a separate heading.

The other headings identified in Table 2.1 fall into two categories. The first of these is a comprehensive programme such as CIM or MRP II. These are programmes in which the principles and practices involved in TQM, JIT and EI can and should be employed. The other category includes items which are actually part of TQM, JIT and/or EI. These for example include kanban and product cells which are practices involved in JIT.

Other authors in the field (Oliver et al, 1994; Williams, 1999) do not define WCM in terms of a number of headings. The general principles of continuous improvement, increasing quality levels, customer satisfaction and employee training are, however, encompassed in their views of what constitutes WCM, but these principles are all in fact included within the concepts of TQM, JIT and EI. The preceding arguments lead to the conclusion that proposition 1.2 can thus be upheld, as all practices identified in the literature in the context of WCM can be subsumed into these three headings.

WCM as a philosophy is difficult to define, and as such poses problems when trying to assess the extent of its implementation in a particular

firm. This difficulty allied with the discussion above justifies the use of the principles involved in TQM, JIT and EI as a means of examining how WCM is being introduced in the firms to be studied. The overall approach in this thesis is that the process of introducing WCM is a continuous journey, not one with a finite ending[15]. The proposition being upheld, therefore, provides a method of measuring WCM not as a philosophy, but as a set of practices that can be operationalised in the workplace. Firms will therefore be compared in terms of their introduction of TQM, JIT and EI practices as a proxy for WCM implementation.

2.3.2 Lack of Theoretical Rigour and Definition

An analogous difficulty arises with regard to theories and definitions of WCM in that there is a great deal of variance in the approaches taken. Motwani et al (1994, p.19) ask why there has been so little effort in published works to date to 'identify the critical factors that constitute WCM practices'. Authors use mostly prescriptive ways of theorising in this field, including action agendas, critical factors and essential components as part of their definitions (Heizer, 1986; Sheridan, 1990;

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[15] Following my delivery of Ingle and Jacobson' s paper 'Approaches to TQM adoption in an Irish Context' at the 4th International Conference on ISO9000 and TQM, April 1999, I was asked 'What is your definition of a world class company?' I answered that there is no definition because for each company it will be different, and 'world class' is an aspiration not a conclusion. The convenor of the session Mr. Robert Osterhoff, Corporate Director of Xerox Corporation, agreed strongly with my assertion.

Keegan and Lynch, 1995). This lack of critical evaluation is partly due to the fact that WCM and its implementation strategies are to a large extent used by practitioners who are not concerned with the theoretical or academic aspects of what they perceive is a practical, all-encompassing way of improving their performance.

There have however been many attempts to compile action agendas, as well as outline the activities that are taking place by organisations taking on a strategic[16] initiative to move towards introducing WCM practices (Motwani et al, 1994; Titone, 1994; Schonberger, 1990; New, 1992; World Class International, 1994), but action agendas although useful for the practitioner do not help to set down and define the critical issues. As will be mentioned later in this section there is still too great a reliance on normative and descriptive work, a problem that is common with other topics in the management and organisational literatures.

There are also many *definitions* of WCM proposed in the literature (Spenchian, 1989; Schonberger, 1990; Jacobi, 1991; Keegan and Motwani et al, 1994; Ronen and Pass, 1994; Lynch, 1995; McCall, 1995a). These authors come to WCM from academic, practitioner and consultancy perspectives and have similar definitions, even though they are worded differently. The definitions that are proposed generally have

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[16] The relevance of strategy to this discussion is addressed in the next chapter.

two main parts: first a statement of the goal, and second an indication of the means of achieving the goal. This can be illustrated with one definition provided by Keegan and Lynch (1995, p.16) who state that 'WCM is the pursuit of superior performance in quality, lead-time, cost and customer service through continuous improvement in JIT manufacturing, TQM and EI'. In this case the goal is superior performance and the means of attaining it is by implementing JIT, TQM and EI in order to achieve 'continuous improvement', the latter phrase being a common theme in the literature that will be referred to in section 2.3.4.

A further *language* problem occurs when trying to fit WCM into academic terms. This is the style of writing that is used which is descriptive and normative rather than critical and analytical. It purports to say the way firms *should be* rather than examining the alternatives and providing critical evaluations of the choices. That is not to say that the recommendations are invalid or unsound, rather that the medium, or style of language, although appropriate for practitioners in that it clearly spells out recommendations, in many ways distorts the message from an academic point of view as it often lacks objectivity and is low on critical evaluation.

Overall, the lack of agreement on a theory is a problem that needs to be addressed by authors in this area, as in order to help develop WCM within an academic context, a clear explanation of what WCM is, and

how it differs from other programmes used in practice needs to be generated. If WCM is to be brought successfully into an academic environment then the theoretical background has to be more stringently developed and applied.

The empirical research on WCM carried out in this study uses the process of first defining the goal, and then stating the means of achieving the goal, as a starting point for the research. The findings from the study are then presented in a way that advances a theoretical argument. This is done by acknowledging the effect that individual strategies and operating environments have on both the determination of the goals, as well as the means by which the objectives are attained.

2.3.3 Drawbacks of Main Research Methodologies Utilised

Most of the empirical research that has been carried out on the prevalence and outcome of WCM initiatives uses large survey based methodologies within high volume industries (Womack et al, 1990; Hanson and Voss, 1993; Motwani et al, 1994; Oliver et al, 1994). There are several problems with such approaches. The survey method in particular does not facilitate the examination of related issues such as differentiating strategies, missions and cultures that have previously been mentioned. As Harrison (1998, p.400) puts it: 'Averaging data from different sources and subsuming that data to a fixed notion of manufacturing performance risks missing the point about how an organisation competes'.

Instead of examining large numbers of companies superficially, Harrison (1998) however goes to the other extreme and focuses on four manufacturing assembly 'cells' within one organisation who had recently implemented WCM. This is a useful study, but perhaps also 'misses the point'. There *is* a need for smaller case-based work, such as this one, but where the unit of analysis (in this case the cell) is less disaggregated.

The empirical work presented later in this thesis is an example of how field research can avoid the problems of both large scale survey research and the lack of generalisability of very narrowly focused studies. In essence it combines the advantages of each, where a number of firms are examined, but in much more detail than would be possible using a large survey. Cross comparisons and contradictions can be analysed to provide a useful starting point for further work in this topic, and the internal and external environments within each firm are taken into account when undertaking the analyses. In-depth studies result in an increased understanding of *why* firms implement WCM practices as well as *how* they are introduced. This is an important issue as the process of implementation will ultimately affect the end result, and the success or otherwise of the particular change programme.

Another problem identified with regard to research lies within the types of industries studied, and the kinds of biases that may be unwittingly set up within the methodology utilised. An example of one such tendency

is provided by New and Swejczewski's (1995) critique of a survey carried out by Hanson and Voss (1993). New and Swejczewski believe that there is a bias in the scoring systems of this survey which was more favourable to firms manufacturing simple or short-cycle products, even though both simple and complex products, and short and long cycle manufacturing firms were surveyed in the study. Commenting further on this work, Harrison (1998, p.398) states that 'it is thus debatable whether the survey conclusions are in practice related to the manufacturing context of the firms concerned'.

Other studies have different shortcomings. Motwani et al (1994) fail even to state what the firms in their study manufactured, which as the previous commentators have shown does have a bearing on the significance of the results. The Womack et al (1990) study concentrated solely on manufacturing plants that only made cars, but the authors in this case felt justified in making grandiose claims regarding the efficacy of the principles of lean production and their universal, equal applicability to all industries, a belief which patently has not been verified in practice. A further difficulty is established following the realisation that most studies tend to concentrate their research on firms that have WCM or similar sets of practices implemented rather than those that have not. This means that those firms without overall initiatives installed are rarely examined in terms of their changes in processes and performance. This is a weakness of the research carried out to date, but is an area that is addressed in this thesis as it was

determined from preliminary investigations that the firms involved encompass a broad range with regard to the extent to which they had introduced WCM practices up to the time of the study.

Overall, the limited amount of empirical research that has been done, the tendency to use large scale surveys, and the concentration on firms that have WCM practices in place reduces the value and generalisability of the findings to date in this field. The work presented in this study however, differs from previous research as a case-based methodology is utilised which will aid the development of theory by analysing not just 'how', but also 'why' and 'with what result' changes pertaining to the introduction of WCM practices have occurred.

2.3.4 Lack of Debate on the Overall Approaches used to Implement WCM[17]

The final gap identified in this critical review section is the lack of debate and research on the kinds of *approaches* used to implement WCM in manufacturing organisations. Following examination of the relevant research, four categorisations of implementation approaches adopted by firms were identified by the author: strategic, philosophical/cultural, random adoption, and continuous improvement

[17] The work presented in this section is incorporated in Ingle and Jacobson (1999).

2.3.4.1 Strategic Approach

Manufacturing strategy in organisations has been a neglected area of expertise, but, due mainly to increases in both competition and the level of customer requirements, it is widely acknowledged that production and manufacturing departments within organisations can provide a major source of competitive advantage (Wheelwright and Hayes, 1985; Hayes and Clark, 1986; Leonard, 1990). Hayes and Wheelwright (1984, p.35) argued over a decade ago that 'if a manufacturing function assembles and aligns its resources through a cohesive strategy, it can play a major role in helping a business attain a desired competitive advantage'. They assert that the production function has great potential to strengthen an organisation's competitive position. Beckman et al (1990, p.68) also strongly state that the 'linking of manufacturing tactics, manufacturing strategy, business strategy, and ultimately customer requirements is critical to a company's long-term competitive success.

Lazonick and West (1995) believe that to achieve sustained competitive advantage, organisations have to achieve higher levels of organisational integration. What they mean by organisational integration is 'a set of ongoing relationships that socialises participants in a complex division of labour to apply their skills and efforts to the achievement of common goals' (1995, p.231). In other words involving employees in the strategy of the company by maximising their skills and potential as well as encouraging cooperation with management. This is a relevant view as it mirrors very closely the emphasis placed on employee involvement

in the implementation of WCM practices. Lazonick and West also find that attaining competitive advantage requires that a concentrated learning process be in place (1995, p.236), again very similar to the concept of continuous improvement that WCM espouses.

The idea that strategy should both reflect and be reflected in organisational processes such as WCM is a fairly new theme, and in fact comes mainly from other literature streams such as management control (Daniel et al, 1995; Kaplan and Norton, 1992) which will be further discussed in chapter three. The kind of strategy that is important for the manufacturing function does not always involve purchasing the most up-to-date technology and providing automation in every part of the plant. Technological excellence is not necessarily the way to compete (Jaikumar, 1986; Hayes and Clark, 1986); Ranalow, 1997; Krafcik, 1988). As Chase and Garvin (1989, p.35) put it:

> 'Who wins and who loses will be determined by how companies play, not simply by the product or process technologies that qualify them to compete ... The manufacturers that thrive into the next generation, then, will compete by bundling services with products, anticipating and responding to a truly comprehensive range of customer needs'.

The strategic approach to implementing WCM is a fairly new concept and thus has not been fully assessed in research terms. Setting up a formal manufacturing strategy is usually a difficult process for organisations, and aligning a major organisational change process to the strategy could be problematic. Hayes and Pisano (1994, p.86) have

found however that companies which can change the manufacturing functions of their organisations into sources of competitive advantage are those that can 'harness various improvement programmes to the broader goal of selecting and developing unique operation capabilities'. They create this strategy by identifying one or two areas in which it can lead the competition, and then develop a plan for building the capabilities it wishes to acquire. This is where choices have to be made, and a rationale for implementing WCM practices must be constructed. 'Before adopting any programme, managers should ask themselves, what specific capabilities will this programme create for my organisation, and are these capabilities valuable in competitive terms?' (Hayes and Pisano, 1994, p.86). Beckman et al also have a view on this:

> Whether a company chooses to employ TQC [total quality control], JIT or CIM [computer-integrated-manufacturing] philosophies is a choice to be made according to *customer* need. If any of these programs are implemented, they should be done with a focus on the cost, quality, availability, and features objectives suggested by the business plan (1990, p. 68) [italics added].

Krafcik (1988), in a paper written some years before Hayes and Pisano's work, found however that implementing an integrated programme of human resource management, manufacturing strategy and new technology can improve a company's operating performance and thus provide a source of competitive advantage. He believes that as the primary indicators of a plant's performance are productivity, quality and flexibility, then the companies which balance these three factors most

effectively to suit their particular markets, will attain a real advantage over their competitors. Krafcik's work agrees with Hayes and Pisano's conclusions in that implementing new organisational practices such as lean management policies has inherent risks that have to be managed very carefully.

Drucker (1990), looking forward to the end of the century, believes that factories operating in the coming decades will not have a "mechanical essence". He says that plants will have a new approach to production whereby 'the whole of manufacturing is seen as an integrated process that converts materials into goods' (1990, p.56). This view leads into the next section which examines the idea of WCM being an overall philosophical or cultural approach to the process of attaining performance improvements.

2.3.4.2 Philosophical/Cultural Approach

The concept of WCM as a philosophy, rather than a technology that can be installed like a new machine, is a fairly common theme in the literature (Brower, 1992; Schonberger, 1994a; Keegan and Lynch, 1995). The view held is that WCM forces a radical rethink of the whole operating and management structure of an organisation in order to flatten hierarchical levels, empower employees and simplify all processes with the aim of continually improving the company and thus providing the customer with an increasingly better service. Keegan and Lynch (1995, p.166) believe that 'applying world class philosophies to a

company brings the different departments together so that the strategies of individual departments are formulated with a view to the total targets for the company'. Gaffney (1991, p.41) further states that the introduction of WCM practices is not just about changing production processes or operations, but means 'a total rewrite of the manufacturing script, a modification of the entire system of manufacturing - philosophy/values, organisation, work process - everything'.

This view of WCM as a philosophy is a normative, idealistic one; the pervasive, imprecise and abstract nature of its recommendations underlines the lack of rigour that is evident in the prevailing discourse. That is not to say that the whole philosophical/cultural argument is inappropriate in this context, but rather that the way it is presented within the literature does not easily lend itself to analytical reasoning, critical evaluation and theoretical debate. One interesting argument has, however, been presented that if further developed could bring a more theoretical base to the WCM discussion. This is the idea that there are in fact two processes taking place when organisations are undergoing transformations in processes or systems. The first is a change in the way the *systems* are being modified, and the second is a change in the company *culture* (Vrakking and Mulders, 1992; Morley, 1995).

Vrakking and Mulders (1992) believe that innovations have to occur in both the systems and the culture at the same time. Culture and working practices cannot be modified sequentially; they have to be

simultaneously developed. This argument brings the level of theoretical debate into a higher plane as it proposes a simultaneous set of changes in order to achieve the desired result. The research that resulted in this conclusion is also based on a single case-study which enabled in-depth investigations of all the processes involved to take place. Morley (1995, p.72) has a similar view and says that an organisation's objectives must be accomplished 'through a congruence between systems and culture'.

The in-depth analysis carried out by Vrakking and Mulders (1992) is what provides a certain amount rigour to the results of their research. Unfortunately they do very little examination of the available literature and thus their work is not grounded in a strong theoretical base to show if or how a *cultural* ethos is different to a *philosophical* ethos. However, their analytical reasoning in terms of their findings, rather than normative statements and lists of action plans is a starting point in the transformation of the WCM literature into a more theoretical plane.

The cultural issue is an important consideration when examining firms implementing WCM. The way that it is introduced, and the kinds of processes that are implemented will depend on the prevailing leadership, technology and employee practices within the internal environment. Implementing a particular process in two firms could lead to different results for both depending on the existing culture and systems in place, and thus it is necessary to examine first, the present strategy and second, the ultimate goal or objective before making changes.

Powell (1995) carried out a major TQM research project. He found that firms who have the tools and techniques of TQM but do not have an underlying culture of management commitment and leadership to support it, cannot attain a competitive advantage. Other literature in this area also highlights the necessity for a culture that facilitates the introduction of organisational changes to be in place before any change occurs (Williams et al, 1990; Purcell, 1991; Morley, 1995). As it was once said "without a knowledge of our history we cannot determine our future"; to stand this on its head, organisations without a knowledge of what they want their eventual destiny to be cannot ordain their present situation in terms of operating policies, technology, culture and structure.

The tangible vs intangible theme is continued by Ciampa (1991) who argues that companies which have successfully implemented total quality demonstrate a certain flair for tapping the potential of individual people in the organisation and identifying appropriate roles for them. This confirms that the ability to encourage employee involvement (EI) and move decision making down in the organisation is not a technique that can be bought in or installed like a software package. There has to be trust by top management, and openness within the organisation if such an approach is to be successfully adopted.

Powell (1995) and Ciampa (1991) make valid points regarding the importance of recognising the role that *intangible* elements play in the

successful completion of any WCM type project, and Rangone (1997) also brings the related issue of core competencies to this debate. Factors such as leadership, commitment and loyalty cannot be completely ignored, but ultimately they are not the sole factors that determine whether a firm has implemented WCM principles. A company can only be said to have successfully installed WCM practices if there is sufficient evidence of improvement in terms of *tangible* increases in turnover, number of employees, product quality or related attributes. The empirical research presented in this study addresses these issues, and provides details of improvements in different areas of the organisations examined.

Ultimately the philosophical/cultural approach is one that is fraught with difficulty due to the intangible nature of its object, and completely contrasts with the next kind of implementation identified, that of random adoption.

2.3.4.3 Random Adoption Approach

What the random adoption approach refers to is the tendency some organisations have to pick and choose techniques and processes out of a list of WCM principles and practices. This can be done in two ways, first as has been already mentioned by a 'cherry-picking' process (Gunnigle et al, 1995), where firms pick a few concepts and tools and implement them fully; and second by a 'sipping and tasting' approach (Jacobson, 1996) where a lot of techniques are tried out in a less than

complete way. Neither of these methods are appropriate for sustained improvement as:

> Thinking in terms of time periods and framing the solutions as the adoption of specific practices can lead to two types of problems. The first is equating an improvement in manufacturing capabilities with a manufacturing strategy. The second is failing to recognise that new practices build new capabilities that can form the basis of a new manufacturing strategy - if they are recognised and exploited (Hayes and Pisano, 1994, p.83).

The random adoption method of installing WCM principles is used by at least one firm in this study, but is not examined in any detail in the literature. This is mainly due to the lack of debate in the whole area of process, but is also reflected in the tendency of those writing in the area to assume that a list of techniques or principles is an appropriate approach to take. There appears to be little recognition that WCM implementation may not be a linear process. The continuous improvement method which is next discussed, provides a further example of an assumption that a certain method must be the best way for all firms.

2.3.4.4 Continuous Improvement Approach

Jaikumar (1986) believes that it is not particular techniques in themselves that cause improvement, but rather the way the organisation utilises them and to what extent they learn from their previous achievements. He summarises this concept succinctly stating that 'success comes from achieving continuous improvement through

organisational learning and experimentation' (1986, p.99). Titone (1994) agrees with this idea that continuous improvement is an essential element of WCM, but does not include quality as part of this process. He essentially has not fully developed an integral framework for WCM, which is a weakness in much of the literature in this area.

Kaplan and Norton's (1992) work on the balanced scorecard which will be further addressed in chapter three also takes into account the idea of continuous improvement[18]. They believe that innovation and learning is one of the four key areas that management have to address in order to achieve competitive success. They put it thus:

> Intense global competition requires that companies make continual improvements to their *existing* products and processes ... A company's ability to innovate, improve and learn ties directly to the company's value. That is, only through the ability to launch new products, create more value for customers, and improve operating efficiencies continually can a company penetrate new markets and increase revenues and margins (Kaplan and Norton, 1992, p.76).

This link between the implementation of WCM practices and the innovation and learning perspective of the BSC will be further addressed in the final chapters.

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[18] The 'continuous improvement' link with the balanced scorecard provides further justification for the use of a theoretical framework that combines the WCM and management control literatures.

Schonberger (1986b) set down an original action agenda for WCM implementation, and in 1990 further expanded it to include the idea of continual, rapid improvement as being a desired goal. New (1992) however, believes that this call for continuous improvement has too restrictive an objective, as there has to be an overall approach to change, not just change for change's sake. This is a valid opinion as there may not be many advantages in continually improving a declining product line, or an item that comprises only one percent of output, a point which Schonberger may have missed.

These two conflicting views are in many ways representative of the overall level of confusion and disagreement that exists in an examination of how firms should and do implement WCM. Many authors appear not to realise that firms installing change programmes differ in many ways, as well as operate in different external and internal environments. Thus the ways in which they implement the new initiatives will also differ[19]. The research presented here will study this issue by examining five firms in-depth in order to determine both why, and how, WCM principles and practices were introduced.

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[19] This point links into the discussion on contingency theory presented in section 3.2.

2.3.4.5 Summary

Analysis of the literature regarding the four proposed implementation modes leads to the conclusion that there is a definite rationale for each of the four modes, although as in the discussion regarding WCM definitions, this is not stated explicitly. The author has thus developed from the literature these specific categorisations which are all included in the following proposition:

P1.3: Strategic, philosophical/cultural, random adoption and continuous improvement are implementation modes that categorise different ways of introducing WCM practices.

This proposition is addressed in chapter six to determine whether the different implementation modes identified in the literature can be confirmed in practice.

2.3.5 Factors Affecting and Affected by WCM implementation Modes

The firms examined in this thesis operate in Ireland as part of multi-national corporations that have German parent companies. As indicated in the opening chapter, it is thus appropriate to investigate whether the relationship between the parent and the Irish firm affects the way in which WCM practices are implemented. It is also important to address a particular *Irish* issue that is related to the question of implementation modes. This is the finding that many initiatives designed to improve quality and performance implemented in Irish organisations have failed.

According to a report generated by the Irish Congress of Trade Unions (ICTU) failures have occurred in this area 'where relationships were characterised by low trust and a traditional adversarial approach' (ICTU, 1993). Low levels of trust have traditionally characterised employee perceptions of management in many Irish firms (Whelan, 1992), and thus the successful implementation of WCM and related approaches provides major challenges.

The relationship between workers and management, as well as between the German parent companies of the Irish organisations studied, is thus examined by means of the following research proposition:

P2.1: Different types of external parent relationships and internal employee relations affect the implementation modes used to introduce WCM practices.

Another area that is potentially affected by the implementation modes used are the kinds of performance outcomes achieved by firms following the introduction of WCM practices. There have been many recorded examples of tangible improvements in organisations implementing change programmes that encompass WCM initiatives (Billesbach, 1991; Brower, 1992: Ronen and Pass, 1994; Keegan and Lynch, 1995). These improvements include shorter response time to orders, reduced cycle times, reduced work-in-progress, increased quality, increased productivity, increase in production floor space, improved employee

relations, reduced capital investment and ultimately increased customer satisfaction. Other research has also found that costs incurred by firms implementing TQM are more than outweighed by the eventual cost savings, in terms of reducing both physical costs such as inventories as well as labour costs (Hogg, 1990). The following research proposition is thus addressed in chapter six in order to examine the association, if any, between positive and negative performance outcomes and the particular implementation mode utilised:

P2.2: Particular implementation modes used to introduce WCM practices can be associated with positive or negative performance outcomes.

Depending on the empirical results, taking this and the previous proposition together could lead to the conclusion that there is some association between the external and internal relationships prevailing in the companies on the one hand, and the performance outcomes on the other. If upheld, a result of this kind would have interesting and important implications for multi-national, non-indigenous firms in Ireland. This issue will be addressed further in chapters six and seven.

2.4 CONCLUSION

Research shows that the implementation of WCM practices can, but does not necessarily, lead to improved performance or increased competitive advantage. Some firms achieve improvements but many do

not. The reasons why the firms in this study have introduced WCM practices will be addressed using proposition 1.1.

The lack of agreed definitions and theory, and the over-emphasis on inappropriate research methods are other inconsistencies that have been identified in this chapter. There is however agreement in the literature on the core practices that constitute WCM as indicated in section 2.3.1. Rather than adding to the number of definitions that have been proposed for WCM however, the common factors of TQM, JIT and EI were defined by the author, and, proposition 1.2 having been upheld in terms of the literature, will form the basis of the empirical investigation with regard to the implementation of WCM practices in the companies studied. The literature review encompassing these three areas suggests that examination of the practices involved in the introduction of TQM, JIT and EI will give a very good indication of how much, what kind, and to what extent change has taken place. This effectively constitutes a method of operationalising the concept of WCM.

One major gap in the literature is the lack of debate on the *ways* in which firms implement WCM, and how the approach chosen can actually affect the resulting performance outcomes. This theme will be addressed in detail using propositions P1.3, P2.1 and P2.2 in order to obtain an increased understanding of the variables and processes involved. During this analysis it will also be possible to ascertain whether the four implementation modes identified in the literature are

reflected in practice, and whether the implementation modes adopted are affected by, or affect, particular areas of the organisations examined.

The next chapter examines the issues of strategy, control and measurement and their relevance to WCM. As has already been shown in chapter one, this is a necessary part of the study as WCM has to be viewed within an overall context of the management control process. In order to address the extent of improvements obtained, the topic of performance measurement must also be examined.

3. STRATEGY, CONTROL AND MEASUREMENT

3.1 CHAPTER OVERVIEW

The purpose of this chapter is to explore the relationship between strategy, control, management control and performance measurement within the context of the implementation of WCM practices. This is a logical progression from chapter two, as the review of the WCM literature there revealed that the issues of management control and WCM are by their very nature related to the overall strategy of an organisation. As Otley puts it: 'the process of performance management begins with the establishment of strategy' (1994b, p.44). The final two research propositions used to address the empirical data are also formulated here.

As an investigation into performance measurement is a major objective of the study, the literature in this area is addressed following the discussion on strategy and management control in order to explore the themes and theories emerging. A critical evaluation of the relevant literature is then undertaken to assimilate all the ideas discussed and to facilitate the construction of the analytical framework for the thesis. This framework is presented at the end of the chapter and includes the original research questions discussed in chapter one, together with the associated research propositions developed in this, and the previous chapter. It is presented in both written and diagrammatic forms.

3.2 STRATEGY AND CONTROL

The topic of strategic management came originally from the corporate planning literature in the 1960s and moved through strategy development and organisational performance in the 1970s (Hendry and Johnson, 1993), to Porter's (1980, 1985) seminal works on strategic fit in the 1980s. In the 1990s, most people writing in the field are in agreement that the most important task faced by top management is actually the implementation of strategy (Daft, 1989; Macintosh, 1994). Researchers are now 'not so much concerned about the *what* of strategy, as the *how* of strategic management' (Hendry and Johnson, 1993, p.3). However, work that has been done in this area is still at the exploratory stage, and there is no single theory that encapsulates the research findings.

In any discussion of strategy it is important to consider how the strategy will be controlled. Control within organisations is an area that originally evolved from the accounting function, where measures such as cost control, cost effectiveness, profit and return on investment are regularly used to provide feedback on a company's performance (Merchant, 1998). The link between control and strategy is an important one because whatever strategy is chosen in an organisation it must be controlled in some way in order to balance the competing demands that a firm faces (Simons, 1995). Controlling business strategy means more than ensuring that plans are implemented. As Simons (1995, p.29) puts it:

> Control implies managing the inherent tension between creative innovation, on the one hand, and predictable goal achievement on the other, so that both are transformed into profitable growth. Effective control of strategy requires both the freedom to innovate and the assurance that individuals are working productively toward predefined goals.

Control however can be defined, as well as achieved in many ways, and 'control systems must accommodate intended strategies as well as strategies that emerge from local experimentation and independent employee initiatives' (Simons, 1995, p.5). The idea that strategy can be both intended and emergent is not new; the differences between the two are summarised in Table 3.1.

Implicit Assumptions in Intended Strategy	Implicit Assumptions of Emergent Strategy
• strategies are deliberate and intentional • strategies are articulated in advance of implementation • formulation is separate from implementation • strategy making is reserved for top management • strategy equals a plan (Simons, 1995 from Mintzberg 1987a, 1987b, 1990; Anthony, 1965)	• strategies are incremental and emerge over time • intended strategies are often superseded • formulation and implementation are often intertwined • strategic decisions occur throughout the firm • strategy equals a process (Simons, 1995)

Table 3.1 Comparisons of Assumptions in Intended and Emergent Strategies

As indicated in Table 3.1, intended strategies are based on a hierarchical, top-down structure while emergent strategies are based on an intertwined, employee-empowered structure. Although they 'offer competing views of the strategy process, they are not mutually exclusive' (Simons, 1995, p.20). There are examples in the literature showing that successful strategies often flow from the bottom to the top

of the organisation (Pascale, 1984; Fry and Hendren; 1990). In these and similar cases an intended strategy was not fulfilled, as a sustainable emergent strategy developed following salesforce and other employees close to final customers capitalizing on 'emerging opportunities that were not anticipated when plans were formalized. When successful and replicated, these spontaneous actions coalesced into viable business strategies' (Simons, 1995, p.20).

Mintzberg (1987a) has suggested that both hierarchical and emergent strategy models operate simultaneously in firms. He says that:

> As purely deliberate strategy making precludes learning, so purely emergent strategy making precludes control. Pushed to the limit neither approach makes much sense. Likewise, there is no such thing as a purely deliberate strategy or a purely emergent one. No one organization ... knows enough to work everything out in advance, to ignore learning en route. And no one ... can be flexible enough to leave everything to happenstance, to give up all control (Mintzberg, 1987a, p.21).

One area of the literature that links in with this theme is that of contingency theory. The development of this theory was primarily brought about by work done by both Woodward (1958) and Burns and Stalker (1961). In order to make sense of the data they collected regarding organisational structure, they had to adopt explanations of a *contingent* nature, ie that each firm could have a different structure depending on variables such as size, external environment, technology, culture and management style.

This idea of 'no one best way' was adopted in the management accounting literature (from which management control is derived), but a comprehensive and credible contingency theory of accounting has not yet been developed (Otley, 1991). However, the contingent variables that have been identified as having an impact on performance measurement systems design include the external environment, technology, size, and strategy (Otley, 1991), all of which are compared during the examination of the firms in this study. As Barrar (1987, p.225) found however, it may be the case that the companies involved do not 'change the structure of their production [and other] systems in pursuit of organizational goals and objectives as a direct response to environmental contingencies'. This point is further addressed in section 6.4.4.1.

Contingency theory in relation to strategy and control is also relevant to Kaplan and Norton's (1992) work on the Balanced Scorecard (BSC). These authors have found that if a traditional measurement system is used in an organisation, and there is an emphasis on the finance function, then the overall bias in the company measurement system will be one of *control*. If however there is a balanced system that incorporates other functions such as internal processes and learning, then the emphasis will be on the *mission* or strategy of the firm.

The BSC builds on the increasing realisation in the literature that a 'balance' of measures in terms of financial and non-financial controls is

important for organisations to survive and grow in a competitive global environment, and, according to Otley (1994a), has a definite role to play in the development of control and its strategic management. The BSC is addressed further in section 3.9.3, and potential relationships between the scorecard and the research findings from this thesis will be examined in chapter seven.

3.3 MANAGEMENT CONTROL

Control within organisations is an area that originally evolved from the *accounting* function, where measures such as cost control, cost effectiveness, profit, return on investment are regularly used to provide feedback on a company's performance (Merchant, 1998). Management control arose as a body of literature to tackle 'the problem of the relevance of accounting to organisational control' (Otley and Berry, 1980, p.235). (Section 3.9.1 provides a critical discussion on definitions of management control.) It has now, however, become an issue that concerns not only the accountants in a firm, but all of the managers in various specialisms such as human resources, marketing, sales and manufacturing, and is an area that is 'central to the development of business practices that are capable of matching the needs of contemporary business organizations' (Otley, 1994a, p. 299).

The idea of a control strategy as a potentially emergent process, with associated management control and decision making embedded at all levels in the organisation, has changed radically from work carried out

by Robert Anthony in the mid 1960s. In terms of an organisational hierarchy, Anthony viewed management control as separate to both strategic planning which is at the hierarchical apex, and operational control which he placed at the base (1965). He saw management control as the process that links long term goal setting with daily operations and defined it as the method 'by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organisation's objectives' (Anthony, 1965, p.17). The work carried out by Anthony in the 1960s indicated that management control is also relevant to most of the functions that concern the senior management of an organisation, including organisation behaviour, manufacturing strategy and strategic planning.

The human factor was introduced in the 1970s when an interest in the behavioural aspects of accounting and control began to emerge. Hopwood (1976, p.17) for example found that 'the complex processes by which the overall control and direction of enterprises is achieved has attracted the attention of numerous specialists' including cyberneticians, engineers, accountants, operational researchers, sociologists and psychologists. He believed however that despite the efforts of these and other professionals, there was still an inadequate understanding of the overall processes involved, and said that 'the gaps in our knowledge partly result from the fact that a lot more attention has been devoted to the design and development of *controls* on behaviour than to understanding the nature of *control* itself' (Hopwood, 1976, p.18). As

discussed in chapter one the research propositions in this study will examine these issues and thus help to address the gaps in the literature that exist.

In 1995 Otley, Broadbent and Berry published an overview of previous research in management control. Developments in the management control literature now make more explicit reference to the need for recognising and addressing external factors. They thus argue, that because of changes in the overall business environment, in order for research into management control systems to maintain its relevance it should take into account uncertainty, global competition and the concept of continuous improvement as adopted by 'world class' companies (Otley et al, 1995). Otley (1994a, p.299) also states that research in management control is now:

> increasingly concerned with matters of managerial and organizational development, as well as more conventional areas such as performance measurement.

Even though there has been an evolution of ideas in the literature to encompass external, strategic factors in management control, Anthony's view of management control as providing a link between strategy and operations in many ways still holds in the 1990s. Macintosh for example says:

> While strategy and organization structure dictate the appropriate type of control, management accounting and control systems are used to enhance and influence the strategic planning process. The basic premise is that there are important links between environment, strategy, organization structure, and control and that a congruent matching of these variables is essential to performance (1994, p.87).

Otley (1991) however, although recognising the value of Anthony's model, criticises its narrow perspective; he is in particular critical of the lack of attention given to the process of strategy definition and the complexity and individuality of production and service processes in organisations. Lowe and Puxty (1989) have also addressed this issue, making the point that management control permeates the whole organisation from the top end of strategic planning to the bottom end of operations control. Hopwood (1976) also agreed with this divergence from Anthony's model and believes that ultimately control in a firm has to be linked with its overall strategy, and take into account all aspects of the individuals and processes that make up the organisation.

3.3.1 Management Control and Performance Measurement

There is an increasing relationship between the development of the management control literature and the introduction of changes such as the implementation of WCM practices. Management control is now much more closely linked to employees other than top management as companies are undergoing corporate renewals and reinventions which include the introduction of WCM practices and other organisational and technical changes. Otley (1994a, p. 296) puts it thus:

> The objective of the control system now becomes the encouragement of work groups at all levels to take control into their own hands to a much greater extent than has been traditional, and to take responsibility for maintaining the viability of their part of the organization relative to its environment.

The decision to implement any change programme has its own inherent problems and challenges however, and thus can be perceived as a starting point when considering the similarities between WCM systems and performance measurement systems. A certain culture conducive to innovation and risk taking is required for these new types of systems to be successful. Allied to this is the continuous improvement aspect of both WCM and performance measurement systems. If the maximum benefits are to be obtained from either of these two programmes, then there has to be a continuous process of review, change and improvement (Stainer and Heap, 1996; Ricciardi, 1996).

Having relevant and timely performance measures is also important as the behaviour of employees will often depend on how they are assessed. 'The correct choice of measuring techniques, parameters, costing and control, which is the clear responsibility of management, is the difference between improving organisational performance and not doing so' (Ronen and Pass, 1994, p.10). Ronen and Pass are two of the very few authors writing in this field that acknowledge the role that measurement must play in the whole area of WCM. Implementing a list of techniques or practices does not necessarily mean a company can be identified as a WCM organisation. Achieving improvements is the

important issue, and improvements can only be seen to have occurred if the appropriate measures are in place. Within a manufacturing environment, the production process has to be continually enhanced by 'improving its inherent capabilities such as efficiency, reliability or versatility' (Kaydos, 1991, p.2) in order to remain competitive. This means being committed to improvement and thus installing methods and techniques to help measure the improvement.

McDougall (1988, p.9) also emphasises the importance of developing the performance measurement system, and believes that 'the philosophy of measurement should be to focus on competitive variables, those which directly affect the customer, and to structure the measurements and reports so that they promote learning'. Eccles (1991, p.5) agrees with this competitive element and states that:

> Enhanced competitiveness depends on starting from scratch and asking: Given our strategy what are the most important measures of performance? How do these measures relate to one another? What measures truly predict long-term financial success in our businesses?

Finally Euske et al (1993) believe that measurements can play different roles in different settings.

> Measurements, in fact, may be used to prevent change, if they are a core part of the bureaucratic mechanism. On the other hand, it is quite likely that measurements may provide an organization with the means to motivate individuals to change, to adopt new practices and to improve. This is the essential argument of the continuous improvement-based management philosophy associated with Japanese management practices such as TQM (Euske et al, 1993, p.280).

This view complements the literature on potential adverse behavioural consequences of performance measures which is discussed in section 3.6.1.1.

3.4 STRATEGY, CONTROL, MEASUREMENT AND WCM PRACTICES

In the 1990s the relevance of corporate performance to management control is a persistent theme (Barrar and Cooper, 1992). However, although linking strategy with the design of measurement systems has been a proven tool for improving performance[1], typically organisations are still not linking their strategic plans with target setting and resource allocation (Kaplan and Norton, 1993). Control is important but managers must begin to see that measurement 'is an essential part of their strategy [and] ... an integral part of the management process' (Kaplan and Norton, 1993, p.134). A balanced measurement system can be used in an organisation as a foundation for 'an integrated and iterative strategic management system' (Kaplan and Norton, 1996a, p.85), where strategic learning[2] is emphasised.

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[1] Interview with Larry D. Brady, Executive Vice President of FMC Corporation by Robert S. Kaplan, 1993, Harvard Business Review, Sept/Oct, pp. 143-147.

[2] 'Strategic learning consists of gathering feedback, testing the hypotheses on which strategy was based, and making the necessary adjustments' (Kaplan and Norton, 'Using the balanced scorecard as a strategic management system', 1996, Harvard Business Review, Jan/Feb, p.84).

Beckman et al (1990) strongly emphasise the importance of balance in measurement especially in relation to overall strategy. These authors state that as an element of organisational design:

> The performance measurement system must be restructured to support execution of the strategic objectives. To be most effective, the system must also provide competitive norms to reinforce the strategic objectives. The system must reflect contributions to quality, availability and features, as well as to cost, or the organization will focus on cost to the exclusion of the other factors (Beckman et al, 1990, p.72).

As companies implement strategic programmes such as WCM, TQM, JIT and computer integrated manufacturing (CIM), they begin to realise the increasing inappropriateness of solely using measures based entirely on traditional cost management systems. There is an increasing realisation that many of the old, financial-based measures are incompatible with the new operating environments and their associated philosophies (Ghalayini et al, 1996).

New measures such as customer satisfaction and employee involvement are thus becoming more prevalent, while the problems relating to old measures such as direct cost reduction are being increasingly acknowledged (Dixon et al, 1990; Eccles, 1991). Hayes et al (1988, p.153) put the situation in perspective saying that 'most measurement systems in place today do not provide the kind of information needed by companies that seek to create a competitive advantage through manufacturing'. In order to further explore these and related issues, the literature pertaining to performance measurement and the differences

between old and new measures will be presented later in sections 3.6 and 3.7.

3.4.1 Why Performance Measures are Needed

According to Jacobson and Andréosso-O'Callaghan, performance 'refers to the degree of success in achieving stated objectives' (1996, p.221). Thus the first reason why performance measures are required in organisations is to assess the extent of the attainment of stated goals. These authors state that the kinds of performance indicators that can be used at firm, as well as industry and national levels, include: measures of profitability, productivity, market share and competitiveness, efficiency and technological advance. In each of these categories of measures, traditional, financial measures can be combined with new, non-financial indicators.

Performance measures are thus important as they enable an organisation to assess the competition as well as observe progress. 'An effective performance measurement system can guide a firm's efforts to achieve its strategic objectives and move down the path to continual improvement' (Wisner and Fawcett, 1991, p.10). In order to improve performance however, companies have to learn how to carry out their processes more effectively. To do this they have to have an appropriate performance measurement system in place so that they do not concentrate on superficial or irrelevant issues. McMann and Nanni

(1994) believe that an incorrect system can actually prevent or hinder the learning process and thus aggravate problems that already exist.

Kaplan (1990) believes that improving performance measurement systems can lead to enhanced business performance, and also states that there are many ways in which performance measures alone can help increase performance levels. Kaydos (1991) identifies 14 areas where analysing improvements can assist production and other processes including problem diagnosis and identification, strategy communication, definition of responsibility, performance recognition and employee involvement. Measures of performance should not only be established for production areas, but also for indirect areas such as purchasing, design and distribution. The customer is affected by these areas, so they should all be measured effectively, and the results of the measurement acted upon expediently.

Another benefit of performance measurement is that it helps to define goals, which clarifies accountability and encourages cooperation within a firm.

> Performance measurement defines objectives, goals, and targets; prioritises needs; and increases understanding of cause-effect relationships. Without performance measurement, a company will not know where it is and what needs to be done to improve performance. It forces accountability and peer pressure to work together to improve performance (Jacobi, 1991, p.17).

Jacobi goes on to say that measuring performance is a very effective way of communicating company goals and objectives as well as keeping

abreast of the competition. He finds that if employees are responsible for certain measures, then they will work well with other people who also have an input into the attainment of those measures. This often means that barriers between departments can be broken down.

Performance measurement systems are also often viewed as a *support* for decision making. One author believes that such a system should be considered 'the "eyes" of management; if it is not properly established it will impair management's "vision", thus reducing the probability of proper response for different circumstances' (Globerson, 1985a, p.1). Globerson cites a study which found that in a group of companies producing air conditioners, the firms with the lowest performance were the ones who had the poorest quality performance measurement systems. Product failure rates and warranty costs were much higher for the plants with bad measurement systems.

The previous discussions have centred on the relationships between strategy, control and WCM practices as well as the importance of using performance measures as a means of control. The next three sections deal with the changing nature of measures, and evaluate and compare 'old' and 'new' type performance indicators.

3.5 CHANGING NATURE OF PERFORMANCE MEASURES

Global, competitive markets demand that firms wishing to survive continually reassess their goals and strategies. It is thus reasonable to

expect that the measurement systems for these constantly changing products and processes will alter as the objectives do.

> As one set of goals or objectives is satisfied, or as the set of measures becomes too gross to detect improvement, a new set needs to be articulated, and the old set needs to be discarded or modified. This means that there can never be a set of good performance measures that is stable over time (Dixon et al, 1990, p.5).

Dixon et al (1990) thus believe that it is probably impossible (even for different factories making similar products) to have the same, static set of performance measures. This is because both the kinds of difficulties and opportunities which are experienced will vary according to the particular situation and culture prevailing at the time.

Otley (1994a, p.290) argues that 'contemporary business organizations no longer conform to the pattern assumed in the traditional management control literature. In particular they are smaller, less diversified, less hierarchical and have more internal mutual interdependencies than the theory admits'. These are internal changes, which, coupled with the external changes in the environment such as globalisation, concentration, proliferation of alliances, intensifying competition and technological change all lead to variations in the way firms measure and control their performance. Thus a change in emphasis from traditional measures, financial and non-financial, to a balance in measures both traditional and new has occurred.

According to Suzaki (1987, p.233), companies cannot compete as world class manufacturers unless they 'challenge the techniques and work orientation of the entire organisation'. Companies that espouse world class principles and processes change their manufacturing methods and foster cross-training and flexibility in their employees. Implementing these new strategies results in performance criteria based on labour and machine utilisation measures becoming irrelevant, and not assisting in the continual improvement process. Moon and Fitzgerald (1996) also state that simple financial measures cannot be used in isolation to ensure a company's competitiveness and survival, and according to Kaplan and Norton (1992), a sole focus on financial performance may give misleading signals in regard to the introduction of WCM practices.

Innes and Mitchell (1990) found in one study of the Scottish electronics sector that non-financial performance measures were being widely used. New kinds of measures had been developed by the management accountants in the seven firms studied, and were designed to 'supplement the conventional financial measures by reporting specifically on such areas as delivery performance, absenteeism, launch time for new products, quality and machine performance' (Innes and Mitchell, 1990, p.8). There are many reasons given in the literature why performance measures are changing in organisations. Some of these are detailed in the following sections.

3.5.1 Changing Emphasis in Manufacturing Plants

The nature of manufacturing management is changing in order to reflect the emphasis on quality and customer related issues as well as provide a working environment that supports employee involvement and empowerment (Howell, 1986; Dixon et al, 1990; Maskell, 1991). Maskell (1991) thus argues that any measures used must correspond with the new environment. This is confirmed by Howell (1986, p.105) who writes that as 'the factory of the future will be tremendously different from yesterday's, and even today's factory ... then the measures that we use to help manage that factory are going to have to change accordingly'. This statement emphasises one of the most important characteristics of performance measurement, which is that the measures chosen be flexible and open to change. As Carr et al (1997, p.384) put it: 'the increased emphasis on quality as well as technological changes in the manufacturing environment have resulted in a re-examination of traditional performance measures and the demand for a wider range of measurements'.

Dixon et al (1990) also maintain that improved performance measurement systems will enable managers to focus more clearly on overhead costs and help them to make better use of indirect staff. These authors are of the view that effective management is achieved by 'integrating strategies, actions and measures' (1990, p.1). This opinion implies that as strategies and actions are in a constant state of flux,

then the measures to monitor their success or otherwise must correspond with this moving environment.

3.5.2 Flexibility and Responsiveness

Changing levels of customer requirements is another reason why new measures of performance are needed. Customers worldwide continuously demand better quality, improved performance and increased flexibility (Maskell, 1991). The emergence of new organisational techniques such as those involved in the implementation of WCM practices usually means improving flexibility in both product mix and manufacturing processes. However, as already discussed in the previous sections, traditional systems for measuring performance cannot provide all the required data that is necessary to make decisions in the new environments (Wisner and Fawcett, 1991). Research by Cox (1989) has shown that although managers view flexibility as being of vital importance to a company's competitiveness, it is not generally included in the planning objectives or formally stated in the performance measurement system. Cox believes this is because flexibility is a new priority and methods for evaluating it have not yet been properly developed.

3.5.3 Inappropriate Financial Measures

Finally, as will be discussed more fully in the next section, the traditional way of measuring performance has been through management accounting techniques; methods which alone are no longer appropriate

in today's flexible and customer oriented environment. There is growing dissatisfaction with these approaches as the information they provide does not support a WCM type environment.

> Performance measurement systems based on traditional cost accounting data simply do not provide the right kind of information to allow a company to remain competitive in today's market place. Many of the typical measures generated by cost accounting systems lead managers away from concentrating on what is truly important in manufacturing (Dixon et al, 1990, p.3).

These traditional management accounting methods of measurement also have other shortcomings as they are often irrelevant to the manufacturing scenario, tend to distort costs, are inflexible and impede progress in the introduction of WCM practices (Maskell, 1991). Summarising this area, Euske et al (1993, p.281) believe that 'performance measurement systems are a vital element of change process in organizations... [and] efforts to change the focus of the organization should be reflected in changes in the performance measurement system'.

3.6 OLD PERFORMANCE MEASURES

Old or traditional measures based on historical management accounting techniques have been criticised by accountants themselves (Clarke, 1995), as well as industrialists (Levine, 1991), academics (Dixon et al, 1990) and consultants (Schonberger, 1996). These kinds of measures have been labelled unwieldy, out of date, focused on short term gains and incapable of adapting to the changing competitive environment of

customer satisfaction. Accounting-based measures have also been criticised as providing obstacles to change in an organisation (Dixon et al, 1990; Johnson and Kaplan, 1987) and thus cannot be as relevant to the continuously changing, customer oriented competitive environment that is prevalent in many industries today.

Cost-based performance measures include the application of standard costing methods, material variance analysis, measurement of direct labour productivity and the absorption of overheads (Howell, 1986). Other measures available are direct and indirect labour ratios as well as machine utilisation (Gunn, 1987). These yard-sticks of measurement all tend to share a common financial-oriented focus. These kind of measures have been extensively used in manufacturing industries, yet the associated performance systems were predominantly designed by accountants whose objectives are different to those of the production department. Outputs from the accountancy function for example, include generating financial reports for creditors and shareholders, as well as the presentation of cost data for pricing and profitability analysis (Dixon et al, 1990). This kind of information however is not helpful to manufacturing departments. They need timely data that is directly related to the manufacturing process so that quality and productivity levels can be maintained and ultimately improved.

3.6.1 Difficulties with Cost Based Performance Measures

Historically financial performance measurement has been the universal way of assessing how a company is performing, a situation which is gradually changing. It is important to state, however, that the use of some financial measures is, and always will be, a necessary part of control in organisations. Bottom line figures and profit margins are of necessity important issues. However the sole use of these kinds of indicators are no longer appropriate in the present fast changing competitive environment. As Barker (1995, p.31) puts it: 'financial performance measurement is historically a recording system which is now being used more often to support competitive improvement and guide investment, a task it was never designed to perform'. Clarke (1995) groups the criticisms of traditional accounting practice into three broad areas:

1. Management accounting does not capture a firm's progress towards WCM performance
2. The overhead absorption methods used are not clear enough to achieve correct product costing
3. The internal orientation of accounting information is too narrow for strategic decision making (Clarke, 1995, p.46).

He believes that 'if management accounting is to retain its relevance in today's environment it must monitor progress towards the company's goals, which are both financial and non-financial' (Clarke, 1995, p.46).

Some other problems with using only financial based measures are provided in the following sections.

3.6.1.1 Motivators of Behaviour

Hopwood (1974) and Johnson and Kaplan (1987) have written extensively on this area of behavioural motivation and how it can be affected by control and measurement systems. When a performance measurement system is implemented it becomes a very real focus for people in an organisation, which can have either positive or negative effects. If, for example, the system is geared towards measuring customer and quality issues, there is likely to be a different outcome compared to an environment where cost accounting-type measures are emphasised. What can happen in the latter case is that the cost-based measure may begin to 'drive organizational actions and strategies because it tells employees what is important and how their performance will be evaluated' (Lemak et al, 1996, p.5).

Emmanuel et al (1990, p.197) also emphasise the necessity to match company structures and management control systems to ensure that 'decision makers are actively encouraged to implement actions that are beneficial to the overall organization'. They further warn that such systems should not encourage behaviour which provides 'incentives for managers to implement organizationally undesirable actions' (Emmanuel et al (1990, p.197). The kinds of undesirable actions referred to here include managers: making inaccurate recording of expenses that make

the accounting information misleading, not proposing capital investment projects that would involve other parts of the organisations and generating sales with non-credit worthy customers.

3.6.1.2 False Assumption Regarding Direct Labour

Another problem with the cost accounting systems is that they often suggest that full utilisation of direct labour will lead to more effective manufacturing (Dixon et al, 1990, p.23). However, as those who have experience in the internal workings of a factory know, this may not necessarily be the case. Ensuring 100 percent labour productivity can also lead to the finished goods inventory increasing unnecessarily, often in complete disregard for what the customers have actually ordered. Ensuring that production operators are not idle for even one second may mean that costs of storage, distribution and depreciation increase.

Cost is not now such a strategic issue in manufacturing as new principles such as those included in the implementation of WCM practices come to the fore. Cost does not drive a company, rather it must be driven by other factors, and 'managers who treat cost and short-term financial measures as drivers may be sacrificing long-run company health' (Dixon et al, 1990, p.25). 'The basic problem is that accounting systems are not designed to manage operations, but to report the financial results of that management. That is a very important difference' (Kaydos, 1991, p.89).

3.6.1.3 Barriers to Progress

In addition to being inflexible and not providing pertinent information on a timely basis, according to Maskell (1991), using accounting methods as a means of control can actually hold back the progress of an organisation in a number of ways. First, their method of working out the time to 'pay-back' on certain projects can be a barrier to the implementation of WCM practices. Second, cost accounting reports need a lot of detailed data that is expensive to obtain, and third they may also incite people to perform irrelevant tasks in order to improve the appearance of the results reported. Finally, if it is necessary to concentrate on labour and machine efficiency rates then the aim will be to produce large batch quantities of products, rather than to meet customer demand. Similarly, overheads allocation can cause overproduction and unnecessarily large batch sizes.

In summary, the indications are that accountants and other financial professionals will have to adapt to the new environment of change, flexibility and increased competitive awareness (Cooper, 1997). It cannot be assumed that the factory is an isolated entity and factors such as the impact of a process change on a product's acceptance in the market place must be taken into account (Drucker, 1990). Miller and Vollman (1985) have a similar viewpoint and state that there is too much emphasis on direct labour and related costs.

One of the major problems in manufacturing environments is that it has been the norm to improve productivity by cost reductions or direct labour reduction. These approaches however do not achieve the required profitability increases, and can in fact harm organisations (Skinner, 1986). As Skinner (1986) sees it, the problem with trying to increase productivity while reducing costs is threefold:

- It is mostly concerned with direct labour efficiency even though direct labour costs are greater than ten percent of sales in very few industries.
- It ignores other ways to compete that use manufacturing as a strategic resource.
- It fails to provide or support a coherent manufacturing strategy.

One way of improving the situation is to introduce overall changes to an organisation that reduce and ultimately eliminate the focus on direct labour and costs. It is not an easy process however, and requires 'a change in culture, habits, instincts and ways of thinking and reasoning' (Skinner, 1986, p.30). This reversal of previously held beliefs and attitudes may also include the development and implementation of a new manufacturing strategy. If such a strategy is developed it should define the competitive leverage that is made possible by the production function, and could spell out 'an internally consistent set of structural decisions designed to forge manufacturing into a strategic weapon' (Skinner, 1986, p.32).

Otley (1997, p.44) also believes that establishing the overall strategy in relation to products, process and customer satisfaction leads to the development of certain questions, the answers to which 'form the basis of developing a set of key performance measures that will indicate the current position of the enterprise in relation to its objectives'. As has been discussed in previous sections however, the indications are that the realignment of performance measures to the new environment of quality, flexibility and customer satisfaction is lagging the development of the implementation of WCM practices that are being introduced to ensure performance improvements in these areas.

3.7 NEW PERFORMANCE MEASURES

It is relatively easy to determine from the previous discussion that an overall emphasis on traditional cost-based measures has fallen out of favour, and indeed is having a negative effect on competitiveness for many companies. Recent preliminary research has in fact indicated that organisations 'using non-financial performance measures appear to deliver better financial performance than those which rely solely on financial indicators' (Otley, 1997, p.45).

Over the last decade, new measures based on attaining improvements in quality, flexibility and customer satisfaction were developed. Eccles (1991, p.7) states that 'what quality was for the 1980s, customer satisfaction will be for the 1990s ... as competition begins to stiffen, strategies that focus on quality will evolve naturally into strategies based

on customer service'. This point is also strongly brought out in the literature (Otley, 1997; Euske et al, 1993; Schonberger, 1990; Maskell, 1991). Euske et al (1993, p.281) believe that there has been: 'ongoing radical changes in Western management practices due to the adoption of a "customer perspective" and the continuous improvement philosophy ... [and there is a] focus on meeting or exceeding customer requirements as the basis for evaluation performance'.

A company's long-term strategy has to be linked to the decisions made at an operating level, so the performance measures used must be 'flexible, easy to implement, timely, clearly defined at all management levels and derived from the firm's strategic objectives' (Wisner and Fawcett, 1991, p.5). It is insufficient to implement cost cutting regimes in order to increase competitiveness. This approach has the effect of negatively affecting the long term viability of a company, because investment in important areas such as employee training and research and development are either completely cut, or reduced so much it is ineffectual.

Maskell (1991) provides a good explanation of how new performance measures differ from cost accounting measures and explains their characteristics. First, they can be directly applied to manufacturing systems and processes which is something that is very difficult for traditional measurement systems to achieve. Second, the new techniques are not fixed or rigid, and can change according to

requirements at the time. As mentioned previously, there may be different measures employed within individual manufacturing departments in the same organisation, or even within a particular department if they are needed.

Another feature of these 'new' measures is that they are not complicated or time consuming to record or use. This is very important when it is necessary for busy operators and supervisors to do the counting and analysis. Generally the better the measure, the quicker the feedback will be to the people concerned which is vital in a production situation. Yesterday's defects are usually forgotten, today's performance is the main concern. As one of the main purposes of the new performance measures is to encourage improvement rather than just be a method of control. 'It is not sufficient for the measurements to be neutral, to not impede. It is essential to formulate performance measures that encourage rapid learning' (Dixon et al, 1990, p.43).

A final important characteristic of 'new' type measures is that they are generally quality or customer oriented. The Motorola Corporation, for example, have established 'quality as a performance measure at least equal in importance to any cost objectives that already existed' (Beckman et al, 1990, p.72). These authors in common with others, state that performance measurement systems must 'appropriately reflect primary customer needs' (Beckman et al, 1990, p.72).

Wisner and Fawcett (1991, p.7) provide some examples of the focus of new performance measures that should be used in world class environments: inventory levels, throughput lead time, defect rates by category, downtime of tools and machinery, employee training. Using these kinds of gauges will 'guide the firm in its efforts to achieve manufacturing excellence ... [and will] also provide the information necessary for continual improvement of the firm's competitive position' (Wisner and Fawcett, 1991, p.7). Clarke (1995) also has some ideas on the aspirations of non-financial goals. He believes they should offer dependable delivery promises, customise products to customers' needs, introduce new products quickly and provide effective after sales service.

3.8 OLD AND NEW MEASURES COMPARED

The recognition that new kinds of measures are an important consideration for manufacturing companies is not a recent phenomenon. As far back as 1953 the managers in General Electric decided to implement an improved system of management control that would require better performance measures (Anthony et al, 1984). The eight key result areas that were ultimately chosen included traditional measures such as profitability, as well as newer areas such as employee attitude and personnel development. Even in the 1950s, it was perceived that there was a need to strive for balance in measurement. There was an acute awareness that no longer would an entirely accounting, finance based system of performance measurement be enough. Although these kinds of measures have been identified as

being in use several decades ago, it is nonetheless justifiable to call them 'new' as the growing diffusion of the utilisation of these measures in firms is a more recent phenomenon.

More recent research by Lillis (1992) found that companies are using a range of performance measures in terms of accounting and non-accounting controls. This she believes, 'emerges as an important control strategy' (Lillis, 1992, p. 216). Kaydos (1991, p.66) has a similar view:

> The key to having a cost-effective performance measurement system is to measure everything that matters and not much else. It is costly to collect, store, and process data. If the right data is collected and converted to *useful* information which results in decisions and actions, the savings will exceed the costs by a wide margin.

Ghalayini et al (1996) have compared old and new performance measures. The information provided in Table 3.2 is derived from their findings. This table is illuminating as it clearly captures the essence of the difference between the two types of indicators as defined by the literature.

Characteristic	Old Performance Measures	New Performance Measures
Basis of System	Accounting standards	Company strategy
Types of Measures	Financial	Operational and financial
Audience	Middle and top managers	All employees
Frequency	Lagging (weekly or monthly)	Real-time (hourly or daily)
Linkage with "Reality"	Indirect, misleading	Simple, accurate, direct
Shop Floor Relevance	Ignored	Used
Format	Fixed	Flexible/Variable
Local - Global Relevance	Static, non-varying	Dynamic, situation structure dependent
Stability	Static, non-changing	Dynamic, situation timing dependent
Purpose	Monitoring	Improvement
Support for New Improvement Approaches (JIT, TQM, CIM)	Hard to adapt	Applicable
Effect on Continuous Improvement	Impedes	Supports

Table 3.2 Characteristics of Old and New Performance Measures

As indicated in Table 3.2, according to Ghalayini et al, new measures involve employees while the old ones do not, and new measures are much more flexible, applicable and easier to use. (See section 3.9.3.3 for further discussion on this topic.) This is not to say however that cost-based measures have no place in a WCM based environment. Some of the financial calculations and costings will always be needed. The point to emphasise is that the overall culture should be based around the new competitive environment, and this is something that the main performance measurement system will have to reflect and support.

A comment from Schonberger (1996, p.19) is appropriate here to summarise the 'old'/'new' debate.

> Financial data are not the best indicators of manufacturing company strength and prospects. More basic metrics, such as inventory turnover and customer satisfaction, may be more valid. The two measure [company strength's] differently, however. Inventory turns rise and fall slowly as a result of many activities. Thus, turns assess *long-term* changes in company strength. Customer satisfaction, on the other hand, can sometimes shift quickly [short-term] and point to responses needed now [italics added].

Schonberger's (1996, p.19) answer to this need is to provide companies with sixteen principles (see Appendix A) of 'customer-focused, employee-driven, data-based performance'. These principles are not intended to be top management edicts; they are basic ideas that can be implemented by all employees. Each of the principles has five steps, and organisations can thus score themselves out of a maximum of 80 in terms of their adherence to these principles. As will be shown in Table 3.3, this set of principles is just one of many measurement frameworks recommended to organisations by both consultants and academics.

3.9 CRITIQUE OF CONTROL AND MEASUREMENT LITERATURE

An examination of the control and measurement literature is now presented in terms of the problems that were identified during a review of these areas. The following headings cover most of the difficulties found and are used to guide the discussion.

1. Diversity of control and management control literature
2. Nomenclature
3. Diversity of measurement literature.

3.9.1 Diversity of Control and Management Control Literature

There is little consensus in the literature in terms of how control should be defined (Rathe, 1960) even though clarity in definition is a necessary requirement in order to reduce confusion. The main reason why there have been so many variations discussed, and so many ways of defining it proposed, is because that control is a 'process, not a structure' (Euske et al, 1993, p.295). It is much easier to agree on a definition of a tangible structure than a changing process, a point which can be mirrored in the difficulties involved in defining WCM.

Merchant (1985a, 1985b) sees control as an *attachment* to strategy, where the controls are designed to 'reflect' strategic goals. This view is supported by research carried out by Archer and Otley (1991) which examined the planning and control procedures of a medium sized manufacturing company. These authors found that the control systems were consistent with the strategic thinking of the senior management in the firm, and could actually be seen as reflections of the strategy.

In terms of management control, it appears that there are two streams of thought used to help define this area. The first supports the contention that the main purpose of management control is to ensure that the decisions made by management, and the consequent behaviour of other employees are consistent with the strategies and goals of the firm. This can be illustrated by a definition by Otley (1991, p.46) who states that management control:

> is fundamentally concerned with the achievement of the organisation's goals and purposes by the co-ordination of the work of managers within organisations.

This view is supported by authors including Lowe (1971), Anthony (1988) and Merchant (1985a and 1985b).

There are also other definitions proposed. Daniel et al, 1995, p.369) for example state that:

> Management control support[s] strategy by providing information to management for planning, control and decision-making to implement strategic policies.

Here, the emphasis is on management control as a support to strategy rather than just a reflection of it. There are thus two overall views of management control coming from different perspectives; one side sees it as being *reflective* of strategy while the other views it as *supportive* of strategy.

In evaluating the reasons for these opposing views, the first thing to consider is the historical background to control in general. Traditionally this area has been developed by accountants using systematic, formal procedures and financial measures. This mode of operation reflected the authoritarian, hierarchical view of the organisation, where managers and functional specialists were in control, and employees conformed to their systems. The first view of management control, as reflective of strategy, applies to this kind of theory. Top managers decide on their long-term strategies and functional specialists set up systems to achieve those goals.

The second view which sees the management control system not as a reflection of strategy but as a support, has developed following the increasing realisation that many firms are changing their organisational structure and are increasing flexibility within operations in order to meet customer requirements. This increase in flexibility has also meant that employees have had to become multi-skilled and more involved in decision making at all levels of a firm. In this case, the strategic choices are supported by the management control and other systems implemented. One of the main implications of this view of control is that the overall goals of an organisation have to be carefully chosen, as the kind of control systems implemented will have to underpin the intended strategy.

Finally, there are also problems with the kinds of research methodologies that have been traditionally used in the examination of management control systems. The research presented in this thesis however is based on what Anthony (1965) calls 'internal' rather than external controls, where financial accounting is of little relevance to managers in an operational situation. He is unequivocal in his statement of the situation:

> Strategic planning, management control, and operational control are internally oriented ... There is a certain amount of confusion between these processes and financial accounting which has an entirely different orientation ... Society has developed certain financial accounting principles to which all business are expected to adhere, whereas no such externally imposed principles govern management control information' (Anthony, 1965, p.21).

Anthony's (1988) view of the management control process has not changed considerably since his original theories were written. According to Johnson and Kaplan (1987), even though they and other authors provided extensive documentation about what was actually happening in firms in terms of management control, accounting textbooks and other academic research continue to concentrate on simplified, abstract rather than actual representations of control systems.

3.9.2 Nomenclature

As with WCM, one of the difficulties in researching this area is the lack of consistency between authors with regard to terminology and nomenclature. Terms such as performance indicator (Innes and Mitchell, 1990), and performance measure (Chenhall, 1997) are used interchangeably to refer to both financial and non-financial measures with no clear distinction between them. Simons (1995), however, provides a very clear rationale in his work on levers of control and shows that diagnostic control systems are synonymous with the global term of management control.

It appears from the review of the literature that authors are saying a performance indicator is in a broad area such as quality, innovation or flexibility. Within the broad area then there are certain performance measures utilised. Instead of 'indicators' Moon and Fitzgerald (1996) use the term dimensions, while Kaplan and Norton (1992) use the epithet perspectives. The 'dimensions' and 'perspectives' are prescriptive (ie provide headings such as customer, innovation, financial) but 'actual measures of these dimensions will depend on the business type and competitive strategy adopted' (Moon and Fitzgerald, 1996, p.444).

Although there is agreement that the kinds of measures that are appropriate in today's global, fast moving and competitive environment are different to those in a slow moving, monopolistic situation, there appears to be little consensus as to how these two kinds of measures or controls should be grouped. In Table 3.3, fourteen of the contrasting headings found in the literature are presented. This table was developed by the author in order to indicate the lack of consensus that prevails in this area. The most prevalent pair of antonyms used in the literature is financial versus non-financial. Many authors besides Bromwich and Bhimani utilise this coupling as a way of separating the kinds of measures used in manufacturing organisations into two groups (Rangone, 1997; Dixon et al, 1990; Coates et al, 1992; Euske et al, 1993). What appears to be happening is that measurement is being taken as a 'contextually-defined phenomenon; the same "measure" may

have very different meanings and impacts, in different organizations' (Euske et al, 1993, p. 276).

Heading A		Heading B	Author
Financial	and	Non-financial	Bromwich and Bhimani (1994)
Conventional	and	Non-financial	Innes and Mitchell (1990)
Cost-accounting	and	Non-financial	Johnson (1992)
Traditional	and	Functional	Merchant (1998)
Financial	and	Physical	Wruck and Jensen (1994)
Feed forward	and	Feedback	Kloot (1997)
Cybernetic	and	Non-cybernetic	Puxty (1993)
Proactive	and	Reactive	Merchant (1998)
Formal	and	Informal	Mintzberg (1979); Koziol (1996)
Process	and	Structure	Euske et al (1993)
Operational	and	Strategic	Chenhall (1997)
Tangible	and	Intangible	Rangone (1997)
Short term	and	Long term	Carr et al (1997)
Internal	and	External	Eccles (1991)
Direct	and	Indirect	Merchant (1998)
Accounting-based	and	Operational-focused	Euske et al (1993)
Diagnostic	and	Interactive	Simons (1990)
Implicit	and	Explicit	Birnberg and Snodgrass (1988)

Table 3.3 Contrasting Headings for Measurements and Controls

There is a considerable amount of research in the literature that relates to the kinds of measures that are currently used in organisations. Some authors examine the usage of 'traditional' measures, both financial and non-financial (Coates et al, 1992); some focus on the extent of new 'customer-driven' measures utilised (Euske et al, 1993); and others analyse firms which employ mixtures of both types (Innes and Mitchell, 1990).

In essence, what all of these authors have failed to do is to define succinctly the difference between measurement systems up to the 1980s, and measures following that decade. They use terms such as traditional, conventional, financial, and on the other side functional, operational and non-financial to state their case. In this study, several different epithets were considered to define this issue, and pairs including conventional/contemporary and paeleoteric/neoteric were considered. The final choice however is the pairing of old/new[3] which has the advantages of being simple, understandable and also fits in with the literature, in particular Johnson (1992, pp. 122-123).

3.9.3 Diversity of Measurement Literature

As with both WCM and control, there are similar problems when it comes to obtaining agreement on a definition of measurement or a choice of performance measurement system. Neely et al (1995, p.80) go as far as saying that 'performance measurement is a topic that is often discussed but rarely defined'. These authors in their review of the performance measurement literature have found that it is very diverse in its nature and also note that different writers focus on different aspects of performance measurement system design. The author of this thesis also found the same difficulty in examining the literature as the lack of a

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[3] How old and new measures are defined in this thesis is discussed in section 3.9.3.3.

holistic approach makes the study of the subject fragmented. References to measurement can be found in many different disciplines including cost and management accounting, business and manufacturing strategy, management consultancy and organisational behaviour.

One other problem in this area is that, although it is agreed that performance measurement systems are important components of organisational control (Moon and Fitzgerald, 1996; Globerson et al, 1985a), 'there is no general model that conveys a precise constitution of such a system', (Moon and Fitzgerald, 1996, p.41). In Table 3.4 some of the main performance measurement frameworks proposed in the literature are outlined to illustrate this point.

	Author	Framework or Criteria
1	Banks and Wheelwright, 1979	Minimise short-term view
2	Globerson, 1985b	Guidelines for selecting a preferred set of performance criteria
3	Merchant, 1985a and 1995b	Integrated performance measurement systems should focus on continuous improvement
4	Berliner and Brimston, 1988	Maximise resource utilisation
5	Cross and Lynch, 1988/89	Strategic Measurement Analysis and Reporting Technique (SMART)
6	Fry and Cox, 1989	Minimise conflicting views
7	Keegan et al, 1989	Performance Measurement Matrix
8	Maskell, 1989	Seven principles of performance measurement system design
9	Dixon et al, 1990	Performance Measurement Questionnaire
10	Kaplan and Norton, 1992	Balanced Scorecard
11	Ghalayini et al, 1996	Integrated Dynamic Performance Measurement System Framework
12	Schonberger, 1996	Sixteen customer focused principles of performance
13	Neely, 1998	Three modes of measurement framework

Table 3.4 Outline of Differing Performance Measurement Frameworks (Compiled from Neely et al, 1995; Ghalayini et al, 1996; and Schonberger, 1996).

3.9.3.1 Balanced Scorecard

One of the most important of the frameworks presented in Table 3.4 for this thesis is Kaplan and Norton's (1992) balanced scorecard (BSC). Although strategy is mentioned in many of the other systems, these authors underline much more strongly the fundamental importance of strategy to the development of a measurement system, stating that:

> If companies are to survive and prosper in information age competition, they must use measurement and management systems derived from their strategies and capabilities. Unfortunately, many organizations espouse strategies about customer relationships, core competencies, and organizational capabilities while motivating and measuring performance only with financial measures (1996b, p.21).

The BSC keeps some financial measurement as 'a critical summary of management and business performance, but it highlights a more general and integrated set of measurements that link current customer, internal process, employee, and system performance to long-term financial success (Kaplan and Norton, 1996b, p.21). This scorecard is an important development in the measurement literature and has been widely referenced by many researchers since its formulation. As well as being utilised as a means of addressing performance measurement systems in firms (for example Curtis et al, 1998), its principles have also been adopted for use in a multi-disciplinary basis. The BSC has for example been utilised in an analysis of bridging gaps in strategy formulation and implementation (Aisthorpe et al, 1998), contrasted with management by objectives (Palmer and Dinesh, 1998) and integrated with policy deployment (Heredia, 1998).

There are four aspects to the BSC, all of which must be addressed by firms intending to implement such a system: finance, customer, internal/business process and learning and growth (1996b, p.29). As indicated in Table 3.5. The BSC thus enables managers to examine their business from four important perspectives:

Perspective	Examination of Business
Financial perspective	How do we look to shareholders?
Customer perspective	How do customers see us?
Internal business perspective	What must we excel at?
Innovation and learning	Can we continue to improve and create value?

Table 3.5 Perspectives of Balanced Scorecard (Kaplan and Norton, 1992)

The authors of the scorecard acknowledge that justifiable criticisms of financial measures have been made, but they argue that well designed financial control systems can actually enhance rather than inhibit programmes of change such as those incorporating WCM practices (Kaplan and Norton, 1992). Their research has also found that large improvements in areas such as quality, delivery and customer service do not necessarily provide major gains in financial measures. Management has to make a conscious effort to capitalise on these achievements in order to reap the financial benefits.

Kaplan and Norton (1996b, p. 30) believe that:

> The balanced scorecard is not merely a collection of financial and non-financial measurements. The scorecard should be the translation of the business unit's strategy into a linked set of measures that define both the long-term strategic objectives, as well as the mechanisms for achieving those objectives.

Their main point is that an understanding of the interrelationships between financial, customer, internal process and innovation perspective can help managers:

> transcend traditional notions about functional barriers and ultimately lead to improved decision making and problem solving. The balanced scorecard keeps companies looking - and moving - forward instead of backward (Kaplan and Norton, 1992, p.79).

There have, however, been criticisms of this view. Neely (1998) for example argues that a balanced approach is not necessarily appropriate for all organisations in all settings. Schonberger (1996, p.229) also

states that 'scorecard management itself is an oxymoron. We can watch the score but can effectively manage only the basics, the causes, the processes'. He admits however, that implementing a scorecard does help functional managers take business processes outside their own areas into consideration, and believes that it may help to 'wean executives off an overly financial focus' (Schonberger, 1996, p. 229).

3.9.3.2 Choice of Overall Performance Measurement System

Examination of the kinds of systems available to organisations as presented in Table 3.4, indicates the disparity in views that exists within current writings and the relevance of these frameworks, criteria and systems for manufacturing companies has to be questioned. It is very important to have some measures but they can be few and simple; they do not have to be complex.

Crawford (1988) who has carried out research in this area examined six JIT manufacturing companies in order to develop some general conclusions regarding what types of performance measurement systems were appropriate. Two of her main conclusions were that in these kinds of organisations there was little need for complex performance measurement systems, as long as continuous improvement and flexibility were the main objectives for both manufacturing operations and performance measures. Crawford's findings are interesting as they belie the importance of measurement matrices and scorecards detailed in Table 3.4. It does not mean however, that these kind of frameworks

are not appropriate for some companies, but may indicate that a firm does not to have to have one of these systems in place as part of the process of implementing WCM practices.

Firms in which performance measurement focuses solely on labour and equipment productivity will lose in the long term. As has been already shown, this is because such measures are not appropriate for the new manufacturing environment that includes as issues of overriding importance: the promotion of flexibility, increasing quality and ensuring customer satisfaction. Improving performance in these and other competitive areas is one of the main reasons put forward in the literature (section 2.2.1) why WCM practices are introduced in organisations.

As already discussed, Kaplan and Norton (1992, 1993, 1996a, 1996b) found in their work on the balanced scorecard, that 'balance' in measures is the important issue. Allied to this is the ability of organisations to determine the kind of measures, both old and new, that will most benefit their organisation. Otley (1997, p.45) agrees strongly with the necessity for balance saying:

> The establishment of a balanced portfolio of performance measures and reporting mechanisms is a powerful means of managing performance in tomorrow's company.

It is important that managers are aware of the importance of relevant performance measurement systems. They have to ensure that as with the implementation of WCM, the appropriate culture is in place to allow innovation and change to occur within the performance measurement

system. This is a very pertinent point as corporate culture and inertia caused by procedures and processes already in place can be the biggest obstacle in changing these kinds of systems (Harvey, 1995). The important question arising from this topic relates to whether the introduction of WCM practices results in the use of different kinds of performance measurement systems, particularly with regard to a balance in terms of the use of both old and new measures, and a potential emphasis on the use of new measures.

3.9.3.3 Defining Old and New Measures

It is important at this stage to state how old/new measures will be defined during an examination of the empirical findings in this area. As already discussed, the age of a particular measure is not an issue. Old measures both financial and non-financial such as profit margins and direct labour productivity have been used for decades and are still utilised. New measures such as employee development have been utilised since the 1950s but have become increasingly relevant since the importance of employee involvement and empowerment to an organisation's performance has been confirmed (Oakland, 1993; Employee Development Bulletin, 1994; Cleland, 1996). The author of this thesis argues therefore, that the involvement of non-management employees and their use of performance measures, is the essential difference between old and new measures. Tentative definitions are thus proposed:

1. Old performance measures may be either financial or non-financial in nature and have an emphasis on top-down control.

2. New performance measures may be either financial or non-financial in nature and have an emphasis on bottom-up control.

These definitions are not comprehensive, and there is potential for overlap between the two kinds of measures. However, given the difficulties already discussed regarding nomenclature and definitions in the literature, there is justification in categorising a measure as broadly, old or new. Even though there is a degree of overlap, the delineation between top-down and bottom-up has a strong base in terms of Johnson's (1992) work,[4] and this provides further justification for the definitions proposed. Johnson contrasts the difference between top-down and bottom-up as 'remote-control' management versus 'process management. He also states:

> A work force empowered to learn and innovate must be the backbone of a strategy to create flexibility by removing constraints. The idea of such an empowered work force is alien to the world of remote-control financial management ... flexibility also requires putting control over processes in the hand of people doing the work' (Johnson, 1992, p.95).

Otley (1994a, p.299) also agrees with this kind of classification, and believes that:

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[4] Johnson, Thomas S., 1992. Relevance Regained: From Top-Down Control to Bottom-Up Empowerment, New York: The Free Press.

> In essence we are having to move away from an hierarchical top-down approach to control to one where self-control, innovation and empowerment are of at least equal importance. The controller is no longer embodied in the higher reaches of the organisation; the control function now needs to be embedded at all levels. Only in such a way can the contemporary organization survive in its rapidly changing environment.

The following two research propositions are thus used to address the extent of utilisation of old and new measures as defined above in the firms studied.

P3.1: Introducing WCM practices results in the use of old and new measures within an overall performance measurement system.

P3.2: Introducing WCM practices results in an emphasis on new measures within an overall performance measurement system.

In Table 3.6, comprehensive lists identified from the literature of old and new measures appropriate to the production function are presented. These measures are categorised using the previous definitions, and together with the qualitative interview findings, and quantitative survey information obtained from the performance measurement questionnaire will be used to address propositions 3.1 and 3.2.

Old Performance Measures	New Performance Measures
Standard Costing	Rework
Direct Labour Productivity	Number of Defects found in Process
Machine Utilisation	Number of Defects in Finished Product
Indirect Labour Productivity	Scrap levels
Overhead Allocation by Product	Manufacturing Lead Time
Overhead Allocation by Department	New Product Introduction Time
Raw Materials Investment	% Orders Shipped on Time
Quality of Raw Materials	Raw Materials Turnover
Machine Downtime Costs	Set up Time Reduction
Maintenance Costs	Preventive Maintenance
Employee Downtime Costs	Product Flow Distances
Cost per Component	Space Requirements
Cost Reduction	Employee Cross Training
Material Variance Analysis	Machine Downtime
Employee Involvement	Number of Employee Suggestions
Customer Repeat Order Frequency	Delivery Performance
Supplier Reliability	Reduction in Inventory
Raw Material Availability	Customer Service/Satisfaction
Employee Morale	Work in Progress Reduction

Table 3.6 Old and New Performance Measures Listings

3.10 SUMMARY AND CONCLUSION

The management control and performance measurement literatures are very diverse and also lack an integrative dimension. Authors in this area tend to focus on different aspects of performance measurement system design according to their own particular background and research interest. The implications of this lack of agreement are that the area is still theoretically under-analysed, and under-researched, particularly in terms of case-based studies where in-depth investigations are undertaken in order to advance the development of theory in this area.

The research presented in this thesis will assist the process of theory generation, however, as it focuses on a few organisations in-depth.

The measurement of performance is an area which can make or break a company. If the measures used are valid, appropriate, timely and focus on strategic objectives they will help progress an organisation towards improving their performance and moving ahead of their competitors. Following examination of the management control and performance measurement literature, it was ascertained that, although a plethora of articles and books exist on these issues, there is no common, accepted definition for *management control*. Allied to this difficulty is the realisation that the term *performance measurement* has different meanings for different authors. Words such as 'indicators' and 'controls' are used interchangeably without an adequate definition of meaning and context, particularly in terms of the discussion around the increasing irrelevance of old, top-down measures and the increasing relevance of new, bottom-up measures.

What was done in the literature review in this context was to present the differences of opinion that exist; to explain how management control and related performance measures have not kept pace with the changing global environment; and finally to show the increasing agreement among authors about the need for 'balance' in measures.

An extensive listing of antonym pairs outlining the many different types of measures proposed in the literature was also developed. This led to the conclusion that no one pairing of headings definitively described the changes with regard to the measurement of performance that had been taking place within both the accounting and operations functions. Several alternative sets of headings were considered and the pairing finally chosen was that of *old* and *new*. These were considered to be the most appropriate as, within this pairing, all of the different antonyms described can be captured. To give one example, there are both financial and non-financial measures under both the old and new headings.

'Old' in this study however most often represents the traditional, accounting-based financial orientation of performance measurement that is generally controlled by top management; 'new' represents the contemporary measures that have particular relevance to WCM practices, are not necessarily financial and are often controlled by employees other than managers. Schonberger (1996) summarises these as: financial indicators versus customer satisfaction indicators. A statement by Waggoner et al (1997) provides a fitting end to this section. 'Developing an effective, efficient and balanced set of financial and non-financial performance measures for a business enterprise is one of the principal challenges confronting organisations today' (Waggoner et al, 1997, p.4). It is how companies respond to this challenge that will determine their future.

The next section brings together the original research questions together with the associated research propositions developed in this and the previous chapter. The theoretical framework used to address the empirical findings is thus constructed.

3.11 THEORETICAL FRAMEWORK

Table 3.7 presents the research questions already outlined in chapter one together with the associated propositions that were formulated during the previous literature reviews.

This was a critical part of the research as the framework could only be generated following an in-depth review of the themes and theories in the relevant literatures. In this context the author agrees with Yin's view that the literature review is 'a means to an end and not ... an end in itself' (1994, p.9). The questions and propositions presented in Table 3.7 form the basis of the theoretical framework, and also provide an analytical structure to address the empirical information in terms of the findings and data generated from the five companies that comprise the Irish automotive rubber mouldings automotive component industry. Following the analysis it may be possible to conclude some generalisations for other manufacturing segments and sectors in Irish industry.

No.	Research Question	Associated Propositions
1	Why and how are WCM practices implemented in Irish based multi-national automotive component manufacturing companies?	**P1.1** WCM practices are implemented in order to meet rapidly changing customer requirements and keep up with competition.
		P1.2 All WCM practices can be categorised as TQM, JIT and/or EI.
		P1.3 Strategic, philosophical/cultural, random adoption and continuous improvement are implementation modes that categorise different ways of introducing WCM practices.
2	What is the link between the particular implementation mode used to adopt WCM practices and external relations, internal relations and performance outcomes?	**P2.1** Different types of external parent relationships and internal employee relations affect the implementation modes used to introduce WCM practices.
		P2.2 Particular implementation modes used to introduce WCM practices can be associated with positive or negative performance outcomes.
3	How does the introduction of WCM practices affect the overall performance measurement system?	**P3.1** Introducing WCM practices results in the use of old and new measures within an overall performance measurement system.
		P3.2 Introducing WCM practices results in an emphasis on new measures within an overall performance measurement system.

Table 3.7 Research Questions and Associated Propositions

As already indicated in earlier chapters, the main concerns of this thesis are the issues surrounding the successful implementation of WCM practices in the Irish automotive rubber mouldings component industry and the associated performance measurement systems that support these practices. The theoretical framework adopted thus centres around two areas; the implementation of WCM practices and its relationship with performance measurement within the context of management

control in manufacturing companies. In Figure 3.1, an outline diagrammatic representation of the research framework used is presented. The research propositions listed in Table 3.7 are indicated where appropriate on the figure.

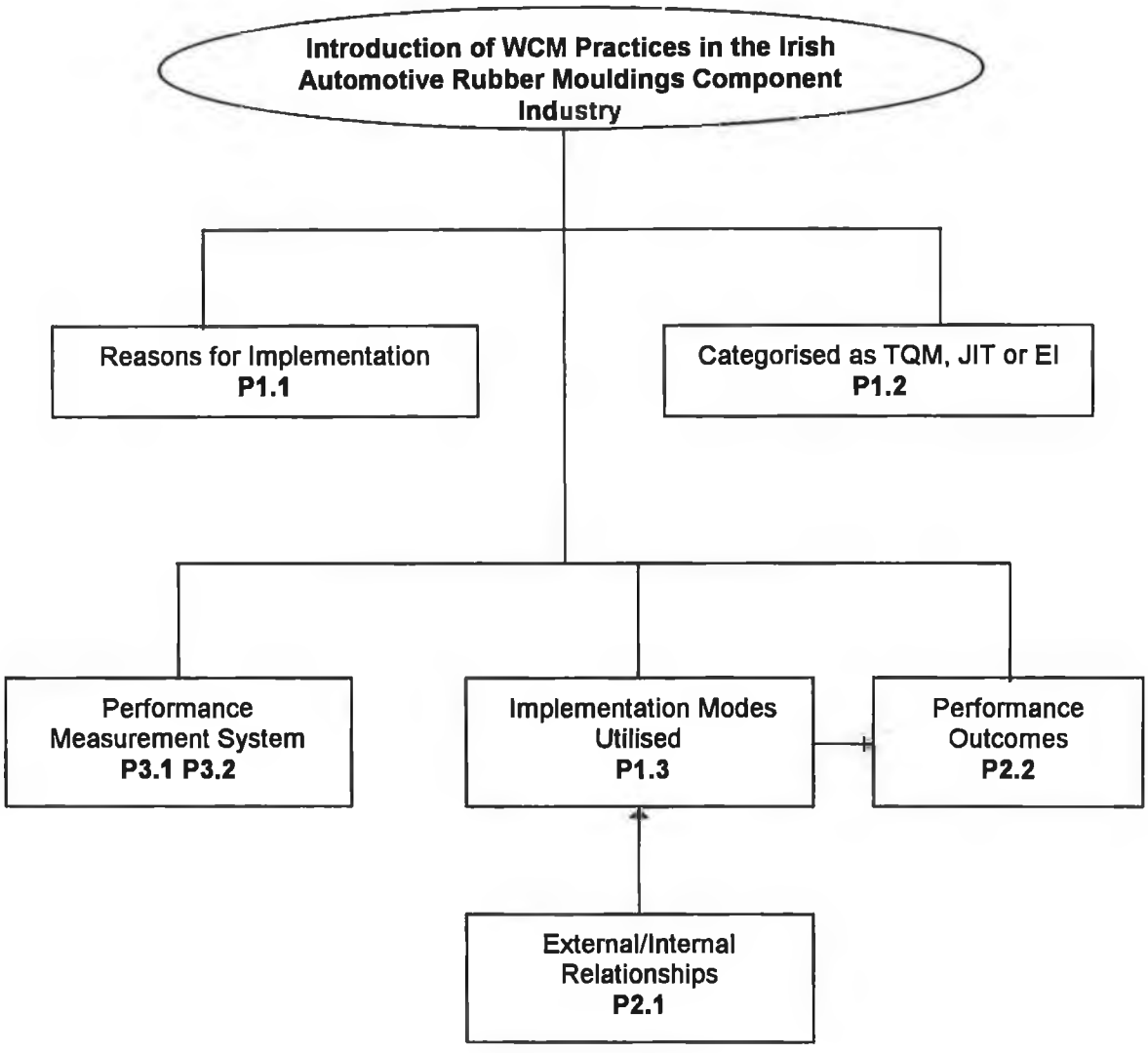

Figure 3.1 Outline Diagrammatic Representation of Theoretical Framework

The first two propositions (P1.1, P1.2) are related to the theoretical constructs regarding WCM implementation. Analysis of the literature in chapter two determined that firms are implementing WCM practices but

have varying reasons for doing so. The composition of WCM also varies in different organisations, but the literature suggests that the common factors are TQM, JIT and EI. The most striking gap in the literature was the lack of discussion on the ways in which WCM practices are implemented, or the *mode* of implementation. Further analysis by the author led to the identification of four alternative implementation modes: strategic, philosophical/cultural, random adoption and continuous improvement which are addressed in P1.3. It appears from the literature as well as preliminary interviews with outside parties[5], that for the firms in this study, these implementation modes are also affected by both the internal dynamics of the companies in terms of management/employee relations as well as the external relationship with the parent organisation. This issue is examined using P2.1.

P2.2 examines to what extent the attainment of positive or negative performance outcomes following the introduction of WCM practices is associated with the type of implementation mode adopted. The final two propositions (P3.1, P3.2) address the relationship between the introduction of WCM practices and the type of performance measurement system that prevails. The literature suggests that the measures being used can be divided into two categories: old (top-down) and new (bottom-up). It is thus proposed that the introduction of WCM

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[5] The interviews referred to here will be addressed in chapter four.

practices will result in the utilisation of a performance measurement system that utilises both old and new measures as discussed in chapter four, but with an emphasis on new performance measures.

In the next chapter the overall research methodology used in the thesis is described and the choice of study cohort justified. Chapters five and six present the findings from the empirical research. A final research model based on the findings is developed in chapter seven and compared with the original theoretical framework based on the literature presented in this chapter (Figure 3.1). 'Analytical generalization' is carried out where the theoretical proposition is used 'as a means of comparing the empirical results of the case-study' (Yin, 1994, p.31). Comparisons and contradictions within the themes discussed are also analysed in the context of the research propositions. Both literal replication (where similar results are obtained from some case studies), and theoretical replication (where contrasting results are obtained for predictable reasons) can be expected.

4. RESEARCH METHODOLOGY

4.1 CHAPTER OVERVIEW

The focus of this chapter[1] is to outline the choice of research design used in the thesis. A discussion on the case-based methodology utilised is followed by an examination of the combinations of firms that were considered in order to make a final decision on the choice of study cohort. Justification is provided for the selection of an industry sub-sector in general, as well as the particular one chosen. The overall research design, and the framework that will be used to analyse the results from the interviews and questionnaires within the chosen sub-sector is then presented and described. This is followed by a discussion of the performance measurement questionnaire (PMQ) that was administered. The chapter concludes with a section explaining the validation of the research.

4.2 INTRODUCTION

As discussed in chapter one, a case-based, field study approach is adopted in this thesis in order to fully address the research propositions by obtaining in-depth information from a number of firms. Analysis of

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[1] The interviews that are referred to in this chapter were carried out during the preliminary research process. A list of these interviewees and their title/organisation is provided in Appendix B, and they are discussed in section 4.5.1.

each company on an individual basis under common themes will bring out the differences, similarities and contrasts in each plant. Using a case-based study allows the context in which each firm operates to be comprehensively examined (Yin, 1994) and the *reasons* for, as well as the details, of their actions determined.

Bruns and Kaplan (1997, p.2) have also found that field research methods are very valuable for understanding the richness of the rapidly changing 'phenomena in contemporary organizations [including] ... global competition ... shorter life cycles for many product and process technologies, [and] new procedures for organizing production processes' These authors also found that 'traditional research methods[2] had no mechanism for learning about the new demands on management ... [or] factors leading to the obsolescence of systems designed decades earlier' (Bruns and Kaplan, 1997, p.2). Although they acknowledge that field studies expose the conflict of 'rigor or relevance', Bruns and Kaplan (1997, p.4) conclude that for fields where the changes taking place 'are poorly documented, or where recent changes in the environment make even well documented conventional wisdom suspect, it becomes

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[2] Bruns and Kaplan acknowledge that previous research in this kind of area, particularly in management accounting, generally took place in the offices of researchers and in university-based laboratories, not in firms. Mathematical and economic modeling, experimental observation and questionnaires or surveys were the kinds of methods used.

important to opt for research methods that fully capture the relevant phenomena'.

The case-based methodology is also appropriate for this study as it facilitates the inductive approach to theory generation; and the emphasis will be on 'description and explanation rather than on prescription and prediction' (Leavy, 1994, p.108). 'How' and 'why' questions are most commonly posed in this research, and these questions in a contemporary setting are more readily addressed using a case study technique (Yin, 1994). As will be outlined later, the choice of study cohort is five companies which further confirms the appropriateness of the case based approach rather than survey methods.

4.3 IDENTIFICATION AND SELECTION OF STUDY COHORT

Before making a final decision about the kinds of companies to be included in the research a number of options were examined. The first option was to focus exclusively on one of the different segments that make up the automotive component sector; the second option was to study companies employing greater than 100 employees, and the third option considered was the examination of the companies with the highest annual turnover. Each of these choices is now reviewed.

4.3.1 Alternative Segments Considered

Following compilation and examination of the data in the An Bord Tráchtála[3] (ABT) Fact File, 1995a, it was found that there were four possible segments that could be investigated as shown in Table 4.1. The other firms in the industry did not fit into clearly definable groups and so were not considered for examination.

SEGMENT	NUMBER OF COMPANIES	TOTAL NUMBERS EMPLOYED
Rubber Mouldings	5	1023
Cable Harness Manufacture	3	850
Pressed Parts	7	650
Plastic Injection Moulding	8	875

Table 4.1 Statistics for Segments Considered in the Sector (ABT, 1995b)

These four segments comprised in total a third of the Irish automotive component manufacturing sector with respect to the numbers employed (ABT, 1995a). Other segments comprised only one or two firms and thus were not considered. Each of the four alternative segments is briefly examined in the following sections.

[3] The government funded agency An Bord Tráchtála (The Irish Trade Board), was set up following a merger of the Irish Export Board and the Irish Goods Council. Its main aim is to help Irish firms to develop sustainable markets of both a domestic and international nature. In 1998 it became part of a new government agency - Enterprise Ireland.

4.3.1.1 Rubber Mouldings

There are five companies in the rubber mouldings segment of this industry with employment levels ranging from 38 to 339. The total employment is 1023. Products and processes are similar and include continuous and compression mouldings. All of the companies in this segment are of German origin and are located in the West or North-West of the country. As has been discussed in chapter one, the fact that the firms to be studied are all part of German multi-national corporations has particular implications for the conclusions and generalisations that arise out of the research findings. This issue will be further addressed in chapter eight.

4.3.1.2 Cable Harness Manufacture

The cable harness segment is a large, clearly definable grouping, and thus has potential as a study base. However, this is a labour intensive part of the industry and therefore will probably not be an area of growth. For example, one of the companies has downsized considerably in the last few years (interview 7), and the recent troubles of a major cable harness manufacturer in Dublin, Packard, have been well documented [4].

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[4] *The Irish Times*, December 1994 - June 1995

The lack of growth is indicated in two main ways: first the recent job losses in companies involved in cable harness manufacture, and second the intensive research that is being carried out on these types of products in order to reduce the amount of cables required in an automobile. Recent products on the market that are replacements for cable harnesses include moulded interconnect devices (MIDs) (Hunter, 1995). In summary, as one of the objectives of this research is to provide ideas and conclusions for the future of the automotive industry, examining this segment was ultimately considered not to be appropriate as the technology used in this segment at present will probably only be used on a small-scale in the future.

4.3.1.3 Pressed Parts and Plastic Injection Moulding

These segments are fairly similar to cable harnesses sector in terms of the number of people employed. Technologically they would be appropriate for inclusion in the study, but there is mostly only very small companies involved.

4.3.2 Companies in Top 20 of Sector by Turnover

Using this approach only companies with a large turnover could be examined. In this case it would be relatively easy and straightforward to pick out companies from a list where it was known that WCM type

practices had been implemented and were proving successful in improving company operations[5].

However, a major drawback of choosing only high turnover companies is, as mentioned previously, the possibility of not taking into account and ignoring organisations which have made good progress in implementing new work practices but are not necessarily achieving high turnover levels.

4.3.3 Companies with Greater than 100 Employees

The data for these firms are shown in Table 4.2.

Number of companies	34 out of 87
Percentage of companies in this category	39% of total
Percentage of employees in this category	78% of total

Table 4.2 Statistics for Companies with Greater than 100 Employees (Compiled from data in ABT, 1995a)

If this method of market segmentation were chosen, there would be a certain commonality with regard to hierarchy and management structure as well as other similarities. The drawback however is that restricting the research to company size means there is the possibility of not taking into account firms that would be very relevant to the study but could not be considered just because they had less than 100 employees. This

[5] Gaining access to senior employees in ABT and IDA Ireland made this possible.

is particularly relevant in an Irish context where the majority of firms are small, employing less than 50 people.

There is another issue here that can also be applied to the previous group of potential firms discussed. This is the difficulty of studying, and making generalisations, about plants that have a variety of products, processes and technologies. Ultimately this provides a further reason why neither of these two segments was chosen for examination, and why one segment comprising firms manufacturing the same products using the same machinery was the final choice.

4.4 JUSTIFICATION FOR CHOOSING SEGMENT OF INDUSTRY

Having considered the previous options, it was decided to choose the rubber mouldings segment of the Irish automotive component manufacturing industry for study. The reasons for concentrating on both a segment in general and the rubber mouldings area in particular are discussed in the following section.

4.4.1 Why Study a Segment ?

The total turnover of the automotive component manufacturing industry in Ireland in 1994 was IR£570m (ABT, 1995b). By international standards this is a relatively small figure, so it is important to emphasise the reasons for concentrating the research on a segment of the industry comprising just five companies. These reasons are now outlined.

4.4.1.1 Detailed Information

Examination of a few companies in a sector means that an in-depth bank of information can be obtained. If the whole industry were to be surveyed, the resulting data would be on a much more superficial level as individual plant visits could not be made. It would not be possible, given the time and other constraints involved, to carry out major studies on every company in the sector, so in order to obtain a deep appreciation of the research material and facts, the approach of scrutinising a few companies in as much detail as possible was taken. An in-depth approach enables the dynamics of the overall situation to be understood more clearly.

4.4.1.2 Meaningful Conclusions and Comparisons

Answering the research questions detailed in the opening chapter by addressing the research propositions will lead to the development of a final model based on the empirical findings for the firms studied. This model may prove to be useful for other companies in the process of implementing WCM practices to improve the manufacturing performance of their organisations and/or changing their performance measurement systems.

Defining the research area more narrowly ensures that any such model obtained will be meaningful and relevant. As already mentioned, choosing one particular segment also allows direct comparisons to be made between companies without having to take into account any of

the effects that differences in products, processes and market environment will make. Taking this approach also means that the number of possible variables involved will be considerably reduced, and thus the research process will be simplified. Nicholson et al (1990) have also used this method in their study of the UK wool textiles industry. These authors state that:

> Controlled comparisons of companies within single industries or sectors have been comparatively rare .... [however] they avoid the dangers of being over impressed by the idiosyncrasies of the single case, whilst ensuring that contextual issues are kept to the fore and inferences not made on the basis of non-comparable differences. In other words, by comparing like with like, fine grained analysis is possible, and generalizations may be constructed with heightened awareness of their boundary conditions (Nicholson et al, 1990, p.516).

The effect of external issues and other potential extenuating variables will however be addressed.

One of the motives of this research is to identify whether companies that have implemented WCM practices have different performance measurement systems to those that have not, and if so to determine how they differ. Thus another reason for focusing on one particular segment is that in order to make comparisons between the results of changing work organisational practices, the original management and working structure should be fairly similar and consistent among firms. This will be much more likely if a complete sub-sector is examined rather than individual companies across an industry.

4.4.1.3 Performance Measurement Questionnaire

The analysis tool used, the PMQ, provides a further motive for examining a segment. This tool is designed not just for companies making the same or similar products, but is also used for comparing several plants within an organisation. One of its designers (J. Robb Dixon) recommended to the author that the PMQ would be of much greater value as an intensive study focused on a few organisations rather than examining the whole sector superficially (interview 2).

A study comprising different firms in one segment of an industry will be able to take advantage of the fact that similar if not identical technology, terminology and product specifications will be used in the different companies, and therefore between-plant results can be compared more closely with a potentially higher degree of accuracy. By focusing on a more clearly defined area than just automotive components in general, the analyses and corresponding research results will be more reliable.

4.4.1.4 Customer Requirements

A final reason for concentrating on one segment of the sector is to be able to determine more clearly how customer demands have impacted upon and changed the way companies operate. This is a very important point in relation to the automotive component industry, as increasing globalisation and competition means that in common with other industries, customer expectations and quality levels required are very high. Examining a segment of the sector in depth will enable the

difficulties and problems regarding the supplier/customer relationship to be revealed more clearly as the firms all have the same or similar customers.

4.4.2 Why Study the Rubber Mouldings Segment ?

There were several reasons why the *rubber mouldings* segment of the Irish automotive component industry was chosen. The first reason is that the type of technology used as well as the level of labour skills involved are common to them all (interview 3). By eliminating the effect of differences in skills and processes in the first phase of the research, it is hoped to be able to obtain insights which will enable the research results to be more generally applied.

The similar equipment, machinery and processes utilised by the rubber moulding component companies contain a more sophisticated technology than other segments in the sector and they are not as labour intensive as, for example, the segment of cable harness manufacture, which avails of semi-skilled workers and is very labour intensive (interview 7). Equipment such as compression and injection moulding machines, as well as horizontal and vertical injection presses, operated by a skilled workforce are standard for rubber products and most of the companies are using state-of-the-art equipment. The pertinent point here is that it is more valuable to study a segment that has potential for technological growth, and can thus be a leader in the automotive component sector as a whole.

Finally, studying the rubber mouldings segment alone ultimately means that meaningful comparisons between companies can be made as so many of the variables potentially affecting the issues involved are the same. As will be discussed further in chapter five, the firms all for example:

- are subsidiaries of multi-national companies
- have the same parent nationality (German)
- are in the same global industry (automotive components)
- are in small to medium sized Irish towns
- are in close geographical proximity
- set up in Ireland following the development of government policy to encourage the growth of exports.

Although the study has limitations in that the final conclusions may not all necessarily be applicable to other manufacturing industries, the overall benefit of holding constant many of the variables affecting changes in processes and measurement systems outweighs the disadvantages. In any case, the kinds of external variables that might influence the firms such as general upturns/downturns in the economy, or new government policy, will affect all firms equally. This issue will be further addressed in the final chapter.

4.5 DETAILS OF DATA COLLECTION

In the following table the detail of the work involved at each stage of the acquisition of the empirical data is outlined.

STAGE	RESEARCH PROCESS DETAIL	QUANTITY
1	**Background Interviews** • Irish automotive component industry • WCM, performance measurement and general issues • Irish rubber mouldings segment	12
2	**Contact with Rubber Mouldings Segment** • Letters sent to rubber moulding manufacturing companies to elicit their cooperation • Follow-up telephone calls to ask for participation • Confirmation of date of plant visit	5
3	**Pilot Study** • Study group one • Study group two	2
4	**Plant Visits to each firm** • In-depth interview with general manager (5) • Collection of documentary evidence • Plant tour	5
5	**Performance Measurement Questionnaire** • Administration to all managers and supervisors in each plant	45

Table 4.3 Research Process Outline

As outlined in Table 4.3, the information gathering process adopted involved five main stages as follows.

4.5.1 Stage One - Background Interviews

In order to help determine whether or not the author's preliminary research questions were viable, three sets of interviews were set up and conducted. Twelve interviews in total were carried out, the details of which are now provided in the following sections.

4.5.1.1 Irish Automotive Component Industry

To begin the research process, an initial investigation was undertaken using published data regarding the automotive component industry in Ireland. As well as this, confidential discussions were held with five middle managers/senior engineers employed in the Irish automotive component manufacturing sector. These people were known to the author through her experience as a senior engineer and manager within Irish industry.

PRODUCT MANUFACTURED	NUMBER OF EMPLOYEES	NATIONALITY OF OWNERSHIP
Rear-view Mirrors	330	American
Car Tyres	706	German
Compressor Wheels	440	American
Cable Harness	800	German
Cable Wire	270	Swiss/Swedish/Irish

Table 4.4 Automotive Component Company Interviews

The kinds of companies in which the interviewees were employed are shown in Table 4.4. This was a useful exercise as it confirmed the hypothesis that change was happening in this industry due to increasing competition and globalisation. Several of these companies had implemented world class type practices, both with and without the help of consultants.

4.5.1.2 WCM, Performance Measurement and the Sector in General

Interviews regarding WCM, performance measurement and the sector in general were carried out with four senior people in both government agencies and academic life. They were of one to two hours duration

and were carried out in the workplace of the interviewee. Two of these interviews were recorded and transcribed, in the other two detailed notes were taken and transcribed very soon after. Their names, organisations and areas of interest are provided in Appendix B (interviews 1, 2, 4, 5). It was ascertained from these interviews that the implementation of WCM and similar programmes was in fact occurring in the industry. The interviews also served to enhance the detail regarding the extent of WCM in Ireland and helped to clarify that the area of performance measurement would be a useful issue to study. A changing approach from the sole use of financial performance measures was also indicated, thus providing preliminary evidence towards confirmation of the individual research propositions. Further information regarding the industry as a whole was also obtained at this stage particularly from ABT.

4.5.1.3 Irish Rubber Mouldings Segment

Three other in-depth interviews were carried out in order to elicit specific information about the rubber mouldings segment of the sector. Again the details of these interviews are provided in Appendix B (interviews 3, 6, 7). One of the interviewees, as well as working for the government funding agency, IDA Ireland, had also completed a masters degree dissertation on the whole sector through which he had acquired current and in-depth knowledge about the industry. The other two interviewees had carried out consultancy with the rubber mouldings companies and were very forthcoming with information and insights.

At this stage it was confirmed that the author could assume that various degrees of implementation of WCM practices were occurring in all companies in this segment. Taking this assumption on board, the empirical research could then be based around ascertaining how, why, and to what extent, WCM practices were being implemented in the five firms involved.

4.5.2 Stage Two - Contact with Rubber Mouldings Segment

The second stage of the research process focused on the actual industry segment selected. It began by sending each company a letter outlining what the research entailed and asking for their cooperation together with a one page *curriculum vitae* of the author. The latter was included in order to allay any fears the managers may have had regarding the researcher's experience and maturity. Both the letter and the curriculum vitae are provided in Appendix C. It was considered, that the author's background as a chartered engineer with seven years experience in Irish manufacturing industry would facilitate access to the companies. This view was subsequently confirmed as all five companies targeted agreed to participate in the research.

This outcome of complete cooperation was particularly positive considering that one consultant interviewed felt that none of them would agree to take part because of their time and work commitments (interview 7). It may however have been partly to do with the fact that every company was promised an individual confidential report that

would provide an explanation of the performance measurement questionnaire, as well as a comprehensive discussion on the results of the analyses based on the employee responses. An indication of how the firms responded in general to the report is provided in chapter eight.

The next part of the process involved telephoning the general managers of each company to follow up on the letter and to ask for an appointment to visit the organisation. This was a difficult and lengthy process as, due to the nature of their business and their high workload, it was often difficult to make contact and several telephone calls had to be made in most cases. Before each visit a fax was sent confirming the visit and outlining the proposed schedule.

4.5.3 Stage Three - Pilot Study of Questionnaire

It is important to carry out a pilot study of a questionnaire to 'see if its answers will in practice provide the information sought' (Preece, 1994, p.106). Although the performance measurement tool described in the previous section had been previously used in North America, it was decided to carry out a pilot study on the adapted questionnaire to:

- Determine if the instructions were clear and easy to follow
- Find out whether the terminology and wording used were suitable for Irish industry
- Ascertain if the improvement areas and performance factors to be rated by the respondents were easily understandable

- Give the author practice in delivering the instructions required to ensure competence and fluency so that the successful completion of the questionnaire by the segment respondents would be facilitated.

The people used for pilot testing purposes were made up of two groups:

4.5.3.1 Group One

Group one comprised the first year class of a two year part-time master's degree in industrial engineering in UCD. The age range was from early-twenties to mid-forties and the graduates involved had a range of work experience in a variety of industries. Following administration of the questionnaire in UCD, examination of the completed booklets and discussion with the group, the following points were noted.

- The author needed to be clearer in explaining why the questionnaire is being administered as well as more fluent in the instructions required to complete it. This was done by ensuring that more practice was carried out before administration to the target companies as well as preparing an introductory and explanatory address to the proposed respondents
- It was decided to omit the detailed instructions explaining how to complete the PMQ provided in the original Dixon et al (1990) questionnaire as the author would be available to answer any queries. This change also had the added advantage that there would only be six pages to be examined in the PMQ booklet instead of the original eight. The questions asked at the beginning of parts two and three were simplified and rendered self explanatory

- The original Dixon et al terminology and wording used, and also the changes made by the author based on her technical knowledge of Irish industry, were found to be appropriate for companies in Ireland.

Most of the improvement areas and performance factors in the PMQ were easily understandable and those that were not were changed slightly. Some of the changes are indicated in Table 4.5.

Original Improvement Area or Performance Factor	Altered Improvement Area or Performance Factor
Performance Measurement	Measurement of Performance
Number of Suppliers	Reduction of Number of Suppliers
Variances	Cost Variances

Table 4.5 Some Changes Made to Original PMQ

Three other performance factors were also added based on the comments obtained from the pilot study: teamwork, employee morale and public relations. Part four asks respondents to state what measures are used to assess their individual performances in five different time frames. This part of the questionnaire was completed satisfactorily.

4.5.3.2 Group Two

Group two comprised eight people from a large electronics manufacturing company in Dublin. The author had a contact there, and was able to obtain permission for six people from different functions and at different levels to complete the questionnaire. (Two of the people in the first group were also in this company, hence eight in total.) This was useful because this group were all from the same organisation, similar to the proposed respondents in the study proper. There were no

major difficulties with the PMQ from this group and any minor queries were similar to those of group one.

4.5.4 Stage Four - Plant Visits

Each plant was visited between April and November 1996 to collect the field data. The three methods of data collection that were utilised in this study at the firm level were:

- In-depth interview with general manager
- Collection of documentary evidence
- Plant tour and observation

As already discussed in chapter one, the reason why these were chosen was to reap the benefits of combining qualitative and quantitative methods.

4.5.4.1 In-depth Interview with General Manager

Interviews are a valuable way of obtaining information as they allow the researcher to 'gain rich insights to issues which are normally not amenable to questionnaires' (Simon et al, 1996, p.36). Marshall and Rossman (1995, p.80) recommend in-depth interviewing as an appropriate method for both exploratory and explanatory studies. They believe that interviews have particular strengths such as:

- Creating the opportunity to obtain large amounts of information quickly
- Possibility of immediate follow-up and clarification

- Allowing the researcher to understand how people view their daily activities.

An interview was carried out with each general manager in the five companies studied. The aim of this interview was to elicit in-depth information about the particular firm in areas such as reasons for set-up, relationships with parent companies, extent of implementation of WCM practices and the type of performance measurement system utilised. 'The purpose of interviewing is to find out what is in and on someone else's mind. We interview people to find out from them those things we cannot directly observe' (Patton, 1980, p.196).

The interviews each lasted approximately two to three hours and were very informative. The author was able to establish a rapport quite quickly with all of the managers due to her engineering training and experience. Her background was also an advantageous aspect as it facilitated rapid comprehension of the issues involved in this primarily technical industry. The interviews covered all aspects of each company and included questions on their history, organisational hierarchy, changes in production practices, new organisational techniques implemented and the performance measures utilised, so that a lot of very interesting and useful data were generated. Generally the managers were very frank and open about all aspects of their company apart from monetary details of annual turnover which none of them were willing to divulge.

Each interview was carried out using a structured interview approach with the same set of questions (Appendix D) put to each manager in the same order (Nachmias and Nachmias, 1981). This method was used so that changes in wording or other aspects of the questions that might make responses different would be minimised. It was felt that there was a common vocabulary among respondents so that questions could be formulated which would have the same meaning for them all. Some of the questions were designed to be one word answers, while others required more detailed responses. In order to fully take note of the interviewees and what they were saying, and allow the use of exact quotes to enrich the case-study discussion and analysis, a tape recording of each interview was made which was subsequently transcribed. All of the managers agreed to this process before the interview commenced.

It was considered important to deliver the questions in person in order to reassure the interviewee regarding the confidentiality of the research and so that additional information could be gleaned through hesitations, body language, and other non-verbal indicators. As Dooley (1995, p.128) puts it: 'face-to-face surveys maximise trust and cooperation between interviewer and interviewee ... In a personal interview, the interviewer can see and assess the respondent's nonverbal behaviour and habitat'.

Another technique utilised during the interview process was the use of two within-interview questionnaires (see Appendix D). Here, managers were asked to indicate the organisational techniques and processes (25 in total) as well as performance measures (38 in total) used in the manufacturing area of their firm. These comprehensive lists of generic practices and measures were generated by the author following a review of literature in the field. The new practices were separated into the areas of TQM (10 techniques), JIT (9 techniques) and EI (6 techniques) for the analysis but were mixed when given to the plant managers. Similarly, the list of performance measures was mixed during interviews and then separated into 'old' (19 measures) and 'new' (19 measures) for analytical purposes.

The administration of these questionnaires allowed questions regarding the two areas to be asked using both interview and survey instruments. This method also had the advantage of breaking up the interview at two points so that the author could reflect on how the interview was proceeding and quickly determine whether enough time was available to cover the remainder of the questions to be addressed. It also meant the interviewees had a variety of things to do during the interview. Dooley (1995, p.128) is a proponent of this type of technique and states that 'in-person contact also allows the use of special aids'.

4.5.4.2 Collection of Documentary Evidence

Documentary evidence collected in the plants varied in each organisation, but included in most cases company brochures, the ISO 9002 quality manual, manufacturing procedures, quality inspection charts, production efficiency reports and summaries of company reviews. Some companies were more reticent than others in providing data but follow-up telephone contact was made in cases where further information was required, in order to ensure that appropriate and complete evidence was collected for each case study.

4.5.4.3 Plant Tour and Observation

It was considered to be important to carry out a plant tour in order to be able to confirm or negate the impressions that had been obtained from the interviews. Literature about research by observation confirms this view. 'Participant observation is a technique to use when you wish to learn from people's actions what they do, as opposed to what they say they do' (Kane, 1985, p.53). Walking around a plant 'provides an opportunity to observe how work actually gets done' (Upton, 1997, p.98), and also permits a better and more in-depth understanding of the performance potential of the site.

In all firms the author undertook a complete tour of the plant conducted by the general manager or his nominee, lasting approximately one hour. The tour covered all areas of the plant from incoming goods to final delivery, and proved to be a very useful exercise as the details that were

described during the interview could be seen at first hand. Again, the author's engineering training was useful, as she was able to quickly assimilate the plant layout and operations and pose pertinent questions to the tour guide.

However, care has to be taken, as after the observation process there still remains the task of making sense of what was seen. During the plant tour, contact was made with people at all levels in the organisation. At this stage, the author's earlier experience as an engineer and manager within Irish manufacturing industry was vital, enabling her to quickly piece together impressions and views of the organisation in relation to what had been said at interviews and to gain an overall view of the particular firm.

4.5.5 Stage Five - Administration of Performance Measurement Questionnaire

Marshall and Rossman (1995) have found that questionnaire surveys have particular strengths such as accuracy, generalisability and convenience. Thomas (1996, p.115), in defining this technique, says that 'a survey is a procedure in which information is collected systematically about a set of cases such as people, organisations or objects'. The PMQ used in this study is one such procedure where two kinds of cases are identified: the individual respondents or *people*, and the companies or *organisations* to which they belong. The results of the survey provide data on the important improvement areas in each

company and how they are viewed, as well as the relative emphasis each company place on the different performance measurement perspectives.

The PMQ developed by Dixon et al was administered to all of the managers and supervisors in each organisation (see Table 4.6). Appendix E contains the exact questionnaire that was presented to the employees in the companies studied. This questionnaire was adapted from its original format and some of the wording was slightly changed to suit the industry in an Irish situation. The author hoped to be able to administer the questionnaire personally to the managers and supervisors but this was possible only in one case, due to the logistical difficulties of gaining access to all the relevant people in the same place at the same time. (See Appendix F for the introductory and explanatory address to PMQ respondents). In the other four companies, the general manager either undertook to ensure that employees completed the PMQ or appointed a representative to do so.

Although ultimately the PMQ was proven to be a useful analytical tool, there were some difficulties arising from its use which could be addressed if it were to be used in future research. First, some of the improvement areas and performance factors were not completely understood by all the respondents. This difficulty as already mentioned was probably exacerbated by the fact that the author in most cases was not on site to answer questions and discuss issues raised when the

questionnaires were being completed. In the original research plan the author herself intended to deliver the questionnaires but in order to minimise disruption to operations, as well as facilitate the companies and their work schedules, this did not take place. Second, one consequence of allowing an unlimited number of extreme views represented by ticking one or seven on the questionnaire, is that ranking is made more difficult, particularly with a small number of employees involved. As ranking is so important it might be a good idea to force respondents to indicate a limited number of ones and sevens.

Table 4.6 provides an indication of the profile of people who completed the PMQ in each of the five organisations studied. The total number of respondents was 45. One major strength of the use of the PMQ in this study is that there very little non-response bias as all managers and most supervisors in each organisation were surveyed. This is an important point as it means that the results obtained from the PMQ are truly representative of the views of the employees.

Company	A	B	C	D	E	Total
General Manager	1	1	1	1	1	5
Other Managers	0	3	4	4	4	15
Supervisors	2	12	3	3	4	24
Other Functions	1	0	0	0	0	1
Overall Total	**4**	**16**	**8**	**8**	**9**	**45**

Table 4.6 Profile of Respondents to PMQ in each Firm

Each company was presented with an individual report on its particular PMQ analyses. Four comprehensive analyses[6] were carried out for each firm according to the method used by Dixon et al (1990), the authors of the PMQ. Although this resulted in a lot of extra work it was felt to be necessary in order to both encourage involvement as well as indicate to the companies how much their cooperation was appreciated. The report provided each firm with a comprehensive document that included recommendations for improvement within the organisation[7]. Fowler (1984, p.138) notes that 'the key ethical responsibility is to be certain not to overstate the benefits and to deliver the benefits promised'. At both the interview and survey stages, confidentiality was assured to all companies. No firm was discussed with another and no person other than the general manager received a PMQ report from the author.

4.6 PERFORMANCE MEASUREMENT QUESTIONNAIRE

As explained in chapter one, the PMQ used was adapted from the work of Dixon et al in 1990. This questionnaire was chosen because it had already been used as a performance measurement research tool and its validity proved. It also had never been applied in Ireland, and therefore

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[6] The four analyses carried out were alignment, congruence, consensus and confusion. There are descriptive details of these analyses in Dixon et al (1990), and all of the calculations carried out for one company are provided in Appendix G.

[7] Some of the analyses according to Dixon et al's method are described and carried out in Ingle (1998).

presented another opportunity for originality in this particular study. The PMQ Appendix E) comprises four main parts.

4.6.1 Part One - General information

In this part, some general information is requested from respondents including the name of the company, their title and the area in which they work.

4.6.2 Part Two - Improvement Areas

This part is comprised of a list of 23 items called 'improvement areas' which are in the centre of the page. On either side of each of the improvement areas is a Likert scale numbered one to seven. The question that is asked about the scales on the left is: 'What is the importance of improvement in this area for the long-term health of your company?' This is a slight rewording of the question in the original questionnaire which was felt to be unclear as it appeared as 'long-run importance of improvement' (Dixon et al, 1990, p.68). For the scales on the right, the question asked is: 'What effect do current performance measures have on improvement in this area?' This again has been slightly changed from the original. For each improvement area on both the left and right hand sides, the respondents were asked to choose a number on the scale that best represents their opinion.

4.6.3 Part Three - Performance Factors

Part three of the PMQ is similar in outline to part two except the emphasis is now on performance measures or factors. This section covers two pages, as there are 41 factors to be examined. Again, the questions at the top of each set of scales have been reworded to ensure clarity and understanding.

4.6.4 Part 4 - Employee Performance Measures

In the final part of the questionnaire, respondents were asked to give their views on how they felt their personal performance was evaluated in a number of time frames: daily, weekly, monthly, quarterly, annually. There are two main reasons for including this section:

> These data are used to reveal the extent to which individuals believe they are evaluated in the same measures that are given in the questionnaire. Another insight gained from Part IV is the degree to which financial as opposed to non-financial measures are used, and for which organizational levels and functions this is true (Dixon et al, 1990, p.70).

interviews that were carried out were taped and subsequently transcribed. The accuracy of the interviewees' statements is therefore not open to question. The use of an interview technique as part of the methodology also allowed the use of quotes to enrich the analyses when the research propositions were addressed.

Finally, the performance measurement questionnaire (PMQ) is a valid research tool as it has been successfully used in other applications.

interviews that were carried out were taped and subsequently transcribed. The accuracy of the interviewees' statements is therefore not open to question. The use of an interview technique as part of the methodology also allowed the use of quotes to enrich the analyses when the research propositions were addressed.

Finally, the performance measurement questionnaire (PMQ) is a valid research tool as it has been successfully used in other applications. The results arising from the PMQ also confirm the results found at the interview stage, which means that it provides a validation of the findings and perceptions obtained through company interviews and plant tours.

The next two chapters present sectoral and company profiles as well as findings from the empirical research. Chapter five introduces the Irish automotive component manufacturing industry as a whole as well as the individual companies examined in the study. In chapter six the research propositions are addressed.

5. IRISH AUTOMOTIVE COMPONENT INDUSTRY

5.1 CHAPTER OVERVIEW

This chapter has two main purposes, the first of which is to provide a general overview of the Irish automotive component industry. There are five companies in this multi case-based study which together make up the total population of the industry segment examined in this research. The unit of analysis (Yin, 1994) is the individual firm. The second objective is to introduce the particular segment of this sector examined in this thesis by briefly discussing each of the firms involved under the same headings. The implementation of WCM practices, and the kinds of performance measurement systems utilised will be examined in much greater detail in the next chapter.

5.2 OVERVIEW OF IRISH AUTOMOTIVE COMPONENT MANUFACTURING INDUSTRY

In 1907 there were 201 people employed in Ireland working in automobile and motorcycle factories (Jacobson, 1981). More recently there are over 13,000 employees in the Irish automotive component supply sector (An Bord Tráchtála, 1995a) and that number is growing. The Industrial Development Authority (IDA Ireland) was originally slow to recognise the existence of the industry, but in the 1970s it began to encourage the establishment of automotive component manufacturing units. New car designs, and Ireland's entry into the European community meant that many Irish car assemblers were to change to component manufacture as the reduction of tariffs led to competition

from exports (Jacobson, 1989; Hennessy, 1991). As automobile assembly declined throughout the 1980s in Ireland, so component production grew, with a corresponding increase in exports. Since then the amount of components exported has continued to grow, and there has been major changes in both the numbers employed and the value of goods produced.

	1984	1994
Employment	3489	13171
Exports	IR£119m	IR£570m

Table 5.1 Irish Automotive Component Industry Employment and Exports (Brown 1988, ABT 1995a)

Table 5.1 indicates that the number of people employed in the sector has approximately quadrupled while export volume has almost increased by a factor of five.

5.2.1 German Investment

The German market provides the main source of customers for the Irish industry. This is of particular interest here because all of the firms in the study are multi-national corporations with German parent companies. In 1994, components worth IR£272m were exported to Germany out of a total of IR£570m representing a share of 48 percent (An Bord Tráchtála, 1995b). The organisations being supplied included General Motors, Volkswagen and BMW. One of the reasons for the large investment by these companies in Ireland is that many of the German firms 'can no longer find the 'right' staff locally. Rather than move to big cities, some

of them have come to Ireland where they can continue with their traditional practices' (Jacobson, 1989, p.186). Many of them have located outside the main industrial centres such as Dublin, Galway and Cork and have set up in small to medium sized towns as they had done in Germany.

German companies demand very high standards of quality and reliability and this is an area where Irish organisations can compete. Minister for tourism and trade, Charlie McCreevy, speaking at the Irish/German automotive suppliers workshop held in Stuttgart stated that 'a reputation for high quality is one reason why Irish [based] automotive suppliers have been successful in the German market' (An Bord Tráchtála, 1994, p.7). He went on to say that 'Germany is a competitive market in which business will be maintained and increased only through continuous attention to the needs of buyers and the development of closer relationships.' High labour costs in Germany also make the trained, medium priced Irish workforce very attractive to German corporations.

5.3 AUTOMOTIVE COMPONENT MANUFACTURERS IN IRELAND

A typical foreign investment in motor component manufacturing in Ireland has a number of features. It is usually capital intensive and generally most of its material and component requirements are sourced outside Ireland. The workforce is more than likely unskilled and female, and complete as well as semi-completed goods are exported (Wells and Rawlinson, 1994). Distance from vehicle manufacturers is not a major

problem, mostly because the parts produced will be put into a sub-assembly or system at a location much closer to the final car company.

The range of goods that is manufactured by automotive component companies in Ireland is very wide, and varies from air suspension kits to woven wire cloth, as well as carburettors, fuel tanks, mirrors and switch control units. *The Automotive Components from Ireland - Factfile 1995* (ABT, 1995a) is a comprehensive set of data produced by ABT which provides individual information for each of the 87 Irish component producers. This information includes details of the numbers employed, the country of ownership, as well as product lines and operational capabilities. As the data are not collated in the factfile, an analysis is attempted in the following three tables and accompanying text to provide an overview of the kinds of companies in this sector.

5.3.1 Employment

As can be seen from Table 5.2, the most common size of firm is between 51 and 100 employees, while 65 percent overall have between one and one hundred persons employed. Companies like Donnelly Mirrors, Kromberg and Schubert, and Kostal with 330, 600 and 980 people respectively are very much in the minority.

NUMBERS EMPLOYED	PERCENTAGE COMPANIES
1 - 30	18%
31 - 50	20%
51 - 100	27%
101 - 200	14%
201 - 300	10%
301 - 500	5%
501 - 700	3%
700 - 1000	3%
TOTAL	100%

Table 5.2 Irish Automotive Component Sector - Numbers Employed

5.3.2 Ownership

With regard to ownership, Table 5.3 provides data showing how this is divided.

OWNERSHIP	PERCENTAGE COMPANIES
Irish	41 %
American	24 %
German	24 %
German/Irish	4 %
British	2 %
Other	5%
TOTAL	100%

Table 5.3 Irish Automotive Component Sector- Ownership of Companies

Irish owned companies are in the majority at 41 percent while American and German owned are equal at 24 percent each. The 28 percent of companies either fully or partly established by German owners is one reason why 48 percent of the output of the whole sector goes to Germany. It is interesting to note the long lasting Swiss/Swedish/Irish

conglomeration of Wessel, the automotive cable manufacturer, which was formed as long ago as 1949.

5.3.3 Year Established

The information provided in Table 5.4 shows when the 87 companies in the sector were established.

YEAR ESTABLISHED	PERCENTAGE COMPANIES
1990 - 1994	8 %
1985 - 1989	14 %
1980 - 1984	22 %
1975 - 1979	30 %
1970 - 1974	10 %
1965 - 1969	4 %
1960 - 1964	6 %
< 1960	6 %

Table 5.4 Irish Automotive Component Sector - Year of Establishment

As might be expected a majority of 52 percent were formed between 1975 and 1984, the time when the automotive assembly industry was declining and the component sector began to grow in importance in Ireland. After 1984, 22 percent of firms were set up, while 26 percent originated before 1975. Companies that were established in the early nineteen sixties include Iralco in Co. Westmeath and SPS International in Co. Clare. The oldest organisation is Trimproof in Co. Meath set up in 1946 to manufacture PVC coated fabrics.

5.3.4 Reasons for Irish Success in Automotive Component Manufacturing

Jacobson (1989) cites several reasons for the spurt of growth of the Irish motor components industry. One factor is the process of globalisation. Major motor companies now source components from all over the world. The determining factor for location is not how near the component maker is to the manufacturing plant, but involves such issues as what tax and other incentives are offered, what are the skill levels of the local labour force and how good is the transport and distribution network.

5.3.4.1 Education and Skills

Another incentive for foreign investment, according to Patrick Morris from the engineering and electronics department of ABT, is that Ireland is 'strong in terms of management, production efficiency and educated workforce' (Morris, 1995, p.21). This view is borne out by others such as Wells and Rawlinson (1994, p.186) who state that 'the Republic of Ireland has a young, well-educated and low cost workforce'. Jack Golden, Managing Director of Semperit also believes that 'any product which is difficult to transport, that's delicate, that's precision made, where close contact with the customer is required is one where Irish industry can compete' (McCall, 1995b, p.11).

Barry O'Dowd from IDA Ireland says that Irish based automotive component manufacturing companies 'have a commanding competitive edge due to their exposure to the latest quality, production and delivery

practices as can be seen from their preferred supplier status with the recently established car plants in the UK' (Keogh, 1993, p.17). Thus overall the view of the future in Ireland within the industry, as well as with trade and other bodies would appear to be a positive one, as the capability exists to supply and deliver reliably, and to the highest levels of quality.

5.3.4.2 Supplier Partnerships

As suppliers to the automobile industry, all automotive component producers have to build trust and a real sense of partnership with their customers as well as adapt to their needs. The motor manufacturers do not want suppliers who deliver parts more-or-less on time, and to more-or-less the required level of quality. As Thomas Johnson, Executive Director of Quality in Chrysler said, 'we want suppliers who have world class capabilities, who invest in their equipment and facilities' (Vasilash, 1992, p.36). Irish automotive suppliers appear to have recognised the need to be competitive by continuously improving their products and processes. Iralco, based in County Westmeath, is one such organisation manufacturing car trim products including mouldings and badgings whose customers include Volvo, Nissan and Audi. This company has recently implemented a programme aimed at improving performances in quality control, new product development and manufacturing flexibility (Keogh, 1993). Other companies are taking part in supplier development programmes, and An Bord Tráchtála is active in encouraging this initiative and getting automotive component manufacturers and their

motor assembly customers together to discuss common problems and issues.

5.3.4.3 Flexibility

One other explanation for success is the sector's willingness to redesign products to suit the European market. The initiative of Government agencies, as well as individual companies in ensuring other component suppliers know of the capability of the Irish sector adds up to further growth.

Overall it would appear that the Irish industry is competitive and as time goes on is quickly learning to adapt to and meet the needs of both their parent companies and the motor manufacturers. Survival depends on delivering quality products on time and at a realistic price, and as the record shows, this can be achieved in Ireland.

5.3.5 Factors Working Against the Irish Automotive Component Sector

Looking at it from another perspective, what are the reasons why corporations wouldn't invest in Ireland? Could cases such as that of Packard Electric[1] that have had well publicised industrial relations problems over the last few years influence a decision to locate in the

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[1] *The Irish Times*, from 16 December 1994 to June 1995 carried a number of substantial articles about the demise of Packard including Gallagher, 23/12/94 p.7 and Yeates, 30/4/97 p.1.

country? Patrick Morris believes not as this one particular case is not representative of the industry at large (interview 5). However 'the issues that are encapsulated in the Packard dispute have sent a chill through Irish industrial policy' (Pluenneke, 1995, p.5). Also the nature of the requirements for companies supplying to the automotive industry are changing. As already discussed vehicle manufacturers now prefer to buy full working *systems* instead of just components that go into a system, and the automotive component sector in Ireland has to continue working towards increasing the amount of systems produced such as completed electrical wiring circuits instead of just the cable harnesses. One other difficulty Ireland has faced is the lack of a broad industrial base (Wells and Rawlinson, 1994).

5.3.5.1 Sector Difficulties

The excess capacity in the car industry, and the increasing competition worldwide has caused difficulties for European automotive component manufacturers, and this sector is expected to lose at least a third of the present 940,000 workers by the end of the century. Allied to this it is estimated that by the year 2000 'there will be no more than 500 significant suppliers and that up to one-third of the medium sized operators will have been eliminated' (Gallagher, 1994, p.12). Ultimately what is happening is that the major corporations are now purchasing greater amounts of components from fewer suppliers. The implication is that many of the smaller companies will disappear or else merge with larger companies. If this is true it would have severe implications for the

Irish industry, but on the other hand Ireland could gain by it if a market niche as well as a reputation for quality and customer satisfaction was achieved. Ireland has a low cost base compared with Germany and Japan, and an inherent ability to deal with periods of hardship before returning to profitability (Morris, 1995), which may provide the required competitive advantage.

5.3.5.2 Research and Innovation

Irish based automotive component producers are now increasingly beginning to realise the importance of research in this competitive market, and across Europe the value of research is especially true in the area of engines, brakes and suspensions (Volpato, 1986). To react successfully to this issue there have to be better relations between the car makers and the component manufacturers. This is happening in industrialised countries as firms are now developing more collaborative relationships with their suppliers. 'Many companies have turned towards single sourcing and long-term contracts with a smaller number of suppliers, whom they expect to take increasing responsibility for quality control, technical innovation and the reduction of inventory through frequent deliveries' (Tolliday and Zeitlin, 1986, p.180). Gaining a single supplier contract has its price, but a price it seems that most organisations are prepared to pay.

5.3.5.3 Japanese Investment

According to Fitzpatrick Associates (1991), Japanese automobile manufacturers have been slow to invest in Ireland for the following reasons:

- Distance from major European markets
- Small domestic market
- Weak sub-contracting infrastructure.

Nevertheless, some Japanese manufacturers have already set up in Ireland across a variety of industries, and government bodies are continually aiming to strengthen Ireland's image in Japan. The main factor that tends to attract these companies is the quality and quantity of skilled labour available. Other reasons for investing in Ireland, according to the Japanese, include: stable political attitudes; elimination of exchange controls and the lack of endangered indigenous sectors such as cars, steel and ships. Initial grants and financial incentives are not a primary concern (Fitzpatrick Associates, 1991).

One of the firms in this study (Company D) is actively addressing the issue of trying to attract contracts from Japanese corporations. The management of this organisation are thus examining their employee involvement and empowerment initiatives as well as developing and reinforcing a quality culture and environment.

5.3.6 Future of Automotive Component Manufacture

According to David Schramm, managing director of Packard Electric Europe, the worldwide demand for automobiles is rising, but there is still over capacity in the automotive component market as well as cut-throat competition. He believes that there will be a 'major shakeout' of the industry within the next ten years but 'until this happens, manufacturers will be constantly engaged in battles to win more work by undercutting their competitors' (O'Keeffe, 1995, p.4). Competition will be severe and only the best will survive. However the future is not looking too bleak in Ireland at the moment as we now export components to the value of £570 million annually and this figure is growing (An Bord Tráchtála, 1995b). 'Many automotive manufacturers are looking for alternative sources of supply and choosing Ireland because of its modern manufacturing facilities and engineering expertise' (An Bord Tráchtála, 1994, p.6). Key markets for Irish car components are Germany, Britain and France.

In the 1990s, cost is not the only factor for choosing one supplier over another, but before the 1970s in the UK 'price competitiveness was the primary criterion on which contracts were awarded' (Turnbull et al, 1992, p.162). There were 'arms-length' relationships between buyer and suppliers and design was not a collaborative process. Little information was given regarding future purchasing patterns of the manufacturers.

Following the oil crisis in 1973-74, competition increased drastically among vehicle manufacturers which forced them to closely examine ways of reducing costs while simultaneously improving quality levels. After certain difficulties between the companies and their suppliers they decided to move away from the old adversarial relationships and progress 'towards reducing unit costs via a *partnership* relationship, resolving scheduling problems, technical difficulties and the like through a process of cooperation rather than competition' (Turnbull et al, 1992, p.163).

5.3.7 Conclusion

Most of the companies in the automotive component manufacturing sector in Ireland are supplying to the very best and most demanding automobile companies in the world such as BMW, Ford and Toyota. They have to be 'world-class' in order to both get and maintain contracts as they are competing against tough, international competition. Along with many other industries, every firm in this sector that wants to stay in business has to keep moving the targets and goals in order to keep pace. As Frank Macher, general manager of the plastics and trim division of the Ford automotive components group put it: 'global competition is reality for the automakers, and that has to be equally true of every component maker as well' (Sleigh, 1993, p.27). Implementing WCM practices is one way of staying in touch with competitors and how the firms in this study achieve this is discussed is discussed and analysed in chapters six and seven.

5.4 OVERVIEW OF RUBBER MOULDINGS SUB-SECTOR

As indicated in Table 5.5, the complete rubber mouldings segment within the automotive component manufacturing industry in Ireland, comprising five companies, is examined in this study. As outlined in chapter four, all of the companies are of German origin and are located in the west or north-west of the country. They are clustered within a radius of 150 kilometres, the centre being 250 kilometres north west of the capital, Dublin.

Company	Year Set up	Employees (1996)	Owners
A	1988	38	German
B	1982	339	German
C	1991	200	German
D	1990	330	German/USA
E	1976	116	German

Table 5.5 Details of Companies in Rubber Moulding Segment

The firms export almost all of their output, with between 10 and 100 percent going to the automotive assembly industry. Annual, on-going price reductions are expected and demanded by their customers. A three-shift a day system over a five-day week is operated by all firms.

5.5 INDIVIDUAL CASE COMPANIES

Each company is now individually introduced in order to set the propositions addressed in the next chapter in context. It covers general issues including when production was begun, why the parent located in Ireland, the structural hierarchy in the organisation and product/process

issues. A brief introduction into the kind of performance measurement system used in each firm is also provided.

5.5.1 Company A

Company A is the smallest company in the study. It began producing in 1988 and employs 38 people including an Irish general manager. This is an interesting organisation because it not only manufactures rubber-to-metal bonded parts such as anti-vibration and engine mountings, but also produces compounded rubber to specific customer requirements. Only ten percent of the final output is manufactured for the automotive industry, while 98% of the goods are destined for export.

The main customers of this company are general engineering distributors as well as Audi, General Motors, Volvo and BMW. Automotive customers have had very little impact on the work practices in the firm, as at present all of the orders are obtained by the parent company. Any liaison on quality, contract renewal, materials or finished products is carried out through the German headquarters. Customers require excellence in the four areas of product quality, service quality, reliability and leadtime.

This firm has grown considerably since it was established and further growth is envisaged over the next few years. Under the plant manager there are functional responsibilities for production, quality, maintenance and administration. The manager finds it difficult however to formulate

long-term strategies as that kind of planning is co-ordinated through the German parent company.

As Company A employs only 38 people, performance measures and controls are flexible and communication on products and processes is relatively direct. The parent company are not interested in internal measures - they only want to know the bottom line at the end of the year. They do not query efficiency levels as the Irish plant has always been more efficient in terms of employees and machines than the German operation. This is reflected in the fact that the target for a bonus payment is 24 loads in Germany, but 28 in Ireland (IVA).

5.5.1.1 Products and Processes

Company A manufactures a wide variety of rubber to metal bonded products of all shapes and sizes. These parts include items such as engine mountings, shock absorbers, dampers and anti-vibration mountings. The firm also produces compounded rubber to customer specifications which is a distinct competitive advantage. There are six main grades of rubber involved and within those there are about two hundred separate mixtures depending on where and how the finished rubber component is being used. There are up to 80 different materials used in rubber-making, and any one product can have between ten and twenty of these in its composition.

There are several processes involved in manufacturing products in Company A. First the rubber recipe for the material is designed to the

customer requirements and the raw rubber from Malaysia is processed into sheets or pellets by mixing and milling. This rubber is then moulded to metal, sand blasted and sprayed with a bonding agent.

5.5.1.2 Reasons for Location

There are many reasons why the management of Company A decided to locate in the West/North-West of Ireland:

- Proximity of airport facilities
- Availability and extent of government grants
- Availability of educated and skilled personnel
- Tradition of other rubber companies being there
- Good infrastructure nearby in Northern Ireland
- 'Word-of-mouth' recommendations from German nationals
- High quality of tool-making facilities in Sligo
- Irish environment, culture and way of life

As will be shown in later cases, these location considerations are common to most of the organisations studied.

In relation to raw material and other supplies, Company A have developed good relationships with suppliers and now source all of their own materials. They have found that they can command better prices than their parent whenever they negotiate incoming goods even with other German organisations. Buying the raw rubber themselves from

Malaysia gives them particular control, and this is helped by the fact that there is no communication barrier with regard to language.

In terms of relationships with other rubber moulding companies in Ireland, Company A would like to have more links with these organisations in order to share ideas, problems and common issues. There are informal get-togethers as many of the managers within the firms know each other and have often worked together before. They co-operate with the IDA at presentations to attract other foreign companies to the area. However Company A does not co-operate on technical or process issues if they feel there would be a potential loss of competitive advantage. This is of particular importance to the firm which is the only company in the study that designs and manufactures rubber. They also have the specialised skill in rubber to metal bonding which some of the other firms would like to develop.

5.5.1.3 Summary

This organisation has a core competence of rubber manufacture which is not available in the other firms in the study which provides it with a competitive advantage. Another strong capability of Company A is its ability to manufacture small orders of parts. With regard to overall performance it is growing in terms of both employee numbers and turnover, and has also attained positive improvement outcomes in quality and delivery related areas.

5.5.2 Company B

Company B began producing in 1982. The German manager of all the European operations is based in Ireland and is responsible for two other plants in Germany and Spain. Two-thirds of Company B's orders are processed through the parent and are ultimately distributed to the customer by the German parent. The remaining one third comes from the vehicle manufacturers themselves and is delivered directly to them.

Company B is a tightly managed firm, and during the 15 years of its operation in Ireland has been led by the same German general manager. The present plant manager is Irish and has been responsible for operations for four years. The main customers are Volkswagen, Mercedes Benz, Valeo, Opel, BMW and Porsche as well as first and second tier suppliers to the automotive manufacturers.

As will be shown in chapter six, Company B utilises many performance measures as part of the overall system. The reports that are generated however are not often read as they generally arrive too late to help with the manufacturing situation prevailing.

There is a traditional hierarchy under the German general manager in Company B with the Irish plant manager having day-to-day responsibility for the shop floor operations. There are three other managers in the areas of quality, technology and maintenance. Over the last couple of years this company has expanded its operations in Ireland. Many of the

organisational changes made such as JIT and kanban systems, are now being implemented in other companies in the group throughout Europe. It has been a pioneer for the parent company in terms of these new work practices.

5.5.2.1 Products and Processes

Company B manufactures rubber moulded parts solely for the automotive industry including o-rings, lip seals, composite seals and gaskets. Approximately ten million parts per month are produced; this is made up of six and eight hundred different components. The processes utilised include compression moulding, injection moulding, drum finishing and deflashing which is carried out by homeworkers[2].

5.5.2.2 Reasons for Location

The reasons why Company B set up in Ireland included:

- Amount of government grants offered
- Low corporation tax
- Availability of plant
- Skilled, educated workforce nearby
- Relatively low labour cost

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[2] 'Homeworkers' are almost universal in this industry. The term refers to people (mainly women) who have finished products delivered to their home for final trimming or 'deflashing'. They are not included in the total workforce being employed solely on a contractual basis.

The proximity of Sligo, which is an important tool-making centre, was not an issue that was considered when the decision on where to locate was being made.

5.5.2.3 Summary

In common with other firms, Company B has to push to obtain strategic plans from the parent organisation, but apart from that has a good working relationship with the corporate firm. The management of this plant believes that there is a WCM system in place in the organisation, and the extent of adoption of WCM type practices in all areas and at all levels in the organisation has resulted in traditional outcomes such as a significant increase in the number of employees and a corresponding, albeit smaller, increase in turnover. Other improvements include reductions in inventory as well as increases in quality.

Formalised quality systems are an integral part of the firm and this plant expects to achieve QS 9000 certification within a year. There is also a high level of employee involvement and cross-functional teams are an integral part of this firm's operating philosophy.

5.5.3 Company C

In 1991, a few years after its parent company opened a very similar plant in the west of Ireland, Company C began its operations in the north-west. Due to the competitive pressure in Europe, in early 1996 the two Irish factories were thoroughly scrutinised, and operating profits and

losses examined. The result of this investigation culminated in a decision to close down the original factory. This plant had been struggling, but nevertheless its closure was a shock to the local community. There was also a feeling of resentment that instead of company C, it was the one shut down [3]. Company C had been having industrial relations, high labour turnover and management problems but they were a more profitable organisation, and this, combined with the benefits to be obtained from operating in an Údarás na Gaeltachta [4] location probably finalised the decision.

This firm is run by an Irish plant manager who has previous experience in similar companies, as well in the West of Ireland plant. He has been in the North-West plant of Company C for eighteen months. A traditional hierarchy with chargehands as well as supervisors is in place, and functional managers are responsible for the areas of production, quality, engineering, finance and planning. The performance measurement emphasis in Company C centres around cost reduction and waste issues, but as will be discussed in the next chapter, other measures related to employee involvement and customer satisfaction are in place.

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[3] Radio interview on Radio Telefis Eireann's *Today at Five*, 8 February 1996.

[4] Government funding agency for Gaeltacht (Irish language speaking) areas.

Ninety percent of products are destined for the automotive sector, and customers include Ford, Volkswagen, Opel, BMW as well as sub-supplier companies. The parent company distribute seventy five per cent of the goods produced and the Irish plant directly distribute the balance, mainly to the UK.

5.5.3.1 Products and Processes

Company C manufactures a variety of rubber moulded parts by compression and injection moulding, including grommets, gear stick covers, cable carriers and plug caps. Rubber to metal products are also produced such as bushings for steering racks and engine mountings. Bonded rubber to plastic is another capability available in this firm. Finishing equipment such as nitrogen deflashers and freeze tumblers are utilised in this firm and the testing and laboratory areas include a freezing tester, ozone cabinet, hardness testers, and measuring devices.

5.5.3.2 Reasons for Location

As the first plant set-up in the West had been successful, the parent company when considering further expansion was happy about Ireland as a choice of location due to financial incentives and the availability of an educated labour force. However the final location of Company C was not their initial choice. They were within one week of signing a contract to locate in Northern Ireland, a project set up by both Republic of Ireland and Northern Ireland industrial development boards when at the last

moment they heard from Údarás na Gaeltachta that there was a site available, and ultimately they chose the Gaeltacht location.

The main reason for the decision was the higher level of grants available - the initial attraction of the original location being very close to the centre of the Irish tool making centre also applied in the new factory. The plant manager also feels that parent companies, although attracted by developing countries because of their low labour costs and proximity to important markets, still feel that a stable economy is worth investing in. He puts it thus:

> *'I think all these European companies will need a solid base like Ireland in case anything does go wrong, because certainly, if I were in India say, I would want backup in somewhere like Ireland because you never know what could happen'. (Interview with plant manager, Company C)*

This firm has a good relationship with the other companies in the sector and the plant manager is on good terms with the other managers, and has already worked with some of them.

> *'We all know each other but we are quietly distant from one another, except maybe for Company B because it specialises in seals. Company D, E and ourselves would almost be in direct competition ... There is still a very secretive connection because it is a dog eat dog situation at the moment for business. Day by day everybody is waiting to see who else is getting into trouble, and it's a buyer's market. Global sourcing at the moment is an absolute killer.' (Interview with plant manager Company C)*

5.5.3.3 Summary

Company C is struggling in its operations for two main reasons: first its strained relationship with the parent organisation, and second the poor industrial relations that have developed with employees. The fact that the location of this plant was mainly based on the level of grants that could be obtained in the Gaeltacht area rather than availability of skilled labour or other factors, may have been a precursor to the low level of employee relations that have ultimately attained to date.

Lack of strategic forethought by the parent company leads to planning difficulties for the Irish firm, a problem which is exacerbated by the internationally competitive environment in which Company C, in common with the other firms in the study, operates. However this firm has greatly improved its performance in recent years, and changed from making huge losses to a situation where it is now almost breaking even. Other process and customer oriented improvement outcomes have taken place as a result of kanban and statistical process control (SPC) implementation.

5.5.4 Company D

Company D was established in 1990. Its parent company in Germany is now owned by an American firm, which made the decision to shut down the moulding part of the operation in Germany and move it all to Ireland in 1993 to reduce labour costs. The glass encapsulated component operations as well as rubber-to-metal parts were left in Germany as

these use much less direct labour. The design and development department also remains there because Company D is still supplying large German car manufacturers such as Mercedes, Opel and BMW.

> *'The engineers want to be close to the design people. Also the company has 50 years expertise, and some people in the firm have 30 years expertise, and we don't want to lose that.' (Interview plant manager Company D)*

Opel is the main customer receiving 30% of Company D's production, but Mercedes generates a higher turnover. It also distributes goods to automotive first tier suppliers.

As well as the unexpected outstanding production orders involved in the move of the moulding operations from Germany, the plant had to accept the transfer of poor equipment and badly maintained machinery causing numerous quality problems. It has been forced to cope with these extra demands which were exacerbated by the new owner's expectations of immediate results.

Company D is a successful and competitive organisation and has grown significantly since its initial set-up. Some members of the management team were hired from another rubber moulding company in Ireland. Early in 1992 a review of all facilities and manufacturing methods took place in order to improve competitiveness. As a result the factory undertook a complete relayout to cellular manufacturing. World class practices were implemented and employees and unions were involved at all stages of the reorganisation. The introduction of cell manufacturing

created new issues such as the change in emphasis of performance measurement from individual or machine level, to group or cell levels. Other changes took place in the performance measurement system particularly in regard to factors addressing customer needs.

As well as the plant manager there are also managers responsible for production, quality and engineering; as well as a value analysis value engineering (VAVE) manager who has responsibility for cost reduction. This is an important position as three to five percent annual price reductions are expected from most customers, and most of the time increases in items out of the control of Company D such as raw material costs are not considered by the car manufacturers.

All of the products manufactured in this plant are destined for the automotive sector and 98 percent of them are exported. Most of the products (90 percent) are shipped to the original parent company in Germany for distribution. Many of the parts have been rationalised and the firm have withdrawn from the white good sector in recent years. Deals have also been done with car manufacturers to ensure profit margins are feasible, and long-term contracts have been set-up.

5.5.4.1 Products and Processes

Company D manufactures many different kinds of rubber moulded products including shock absorbers, cylinder head gaskets and door seals. Injection and compression moulding machinery is utilised and

standard finishing equipment is installed. According to the plant manager there are different 'classes' of products manufactured in Company D:

> *'We have two classes; first we've got the high technology rubber mouldings for pure injection systems. They're not easy to manufacture or design so car companies pay us a better margin on those type of parts. But we also manufacture a lot of things like exhaust hangers and anti-vibration damping parts which are not high-tech - once you've got the basic design sorted out anybody could manufacture them ... we know we're going to come under pressure.' (Interview with plant manager Company D)*

This firm hopes to bring rubber to metal bonded products to the firm as soon as certain current environmental difficulties and capital investment for metal preparation issues have been dealt with.

5.5.4.2 Reasons for Location

Several other countries including Wales, Scotland, Hungary and Czechoslovakia were considered before Ireland was chosen. The IDA assisted in constructing forecasts on where Ireland would stand against these countries in ten years time, and because of the likelihood of high wage inflation in countries such as Hungary and Czechoslovakia, these were eliminated. Existing production efficiencies in other Irish companies as well as the education levels of the available workforce were also factors. These positive points were attractive to the German owner as at that time in Germany, *gastarbeiters*[5] were the main workers

[5] This translates literally as 'guest workers', and refers to the Turkish immigrants called in by the German government in the 1950s and 1960s to work in low paid factory jobs.

in the manufacturing operations. Although employing them meant cheap labour costs, it also caused problems due to their low educational backgrounds, and their inability to read work instructions. This was a problem that German management did not want to repeat in their new plant. The plant manager also says that:

> *'The fact that there was a few German rubber companies sited in Ireland was helpful because the owner was able to benchmark and talk with them, and get information from them about Ireland.' (Interview plant manager Company D)'*

Initially three different sites were considered in different parts of the country. The IDA were heavily targeting the site where Company D is at present and were offering very high levels of grants and financial incentives. The main reasons however for choosing the location were ultimately the near availability of excellent tooling facilities, and also the proximity of two international airports.

5.5.4.3 Summary

In Company D the rapid and major transformations at operations level have greatly impacted on the firm as a whole. Employee numbers increased rapidly, resulting in training problems and related issues, but have now stabilised. The management of Company D are also looking to the future by developing a prototype integrated machine that can carry out all the operations required for a rubber moulded product.

5.5.5 Company E

Company E was set up in 1976 in Ireland, and since its initiation has had a German plant manager and some German administrators. The rest of the workforce are Irish. There have been some industrial relations problems as the workforce was unwilling to make changes in their work-practices. Company E have not undergone any growth in recent years and in fact employee numbers have declined overall. All products manufactured are destined for the automotive industry, and customers include Mercedes, Audi, Opel, Ford, BMW and Volkswagen as well as sub-suppliers who manufacture systems or automotive sub units.

There is a traditional hierarchy in this firm and managers reporting to the plant manager are technical (with responsibility for production and maintenance), quality, personnel, and finance. The German plant manager does not have a participatory style and appears to have a low regard for the Irish workers in the organisation. The performance measurement system of this firm very much reflects the autocratic style of the German plant manager who manages Company E. Control and cost issues are very prevalent, and increasing direct operator efficiency is an on-going target. Other issues such as increasing flexibility and employee involvement or empowerment appear to be almost irrelevant.

SPC and ISO 9002 only form the backbone of the quality system, and preventive maintenance is carried out by the maintenance department without the assistance of direct workers.

5.5.5.1 Products and Processes

A wide range of about 200 basic automotive component rubber moulded parts are manufactured on a regular basis by Company E. Rubber to metal bonding for products such as engine mount assemblies are not carried out in the Irish plant, but are in some of the other parent company factories. Equipment utilised in Company E includes rubber mills, injection moulding machines, drum finishing machines, and mould cleaning technology.

5.5.5.2 Reasons for Location

There are three reasons why the parent company originally located in Ireland. First it was cheaper to manufacture goods in this country as labour costs are lower; this however is changing as, mainly due to partnership programmes with Government, the salaries of the Irish workforce are increasing. Second, good financial incentives were available for multi-national startups as well as grants for machinery. Finally skills and education levels are better in Ireland than in Germany.

5.5.5.3 Summary

According to the plant manager, employee numbers have decreased in Company E as a direct result of the Irish workforce not accepting a 'one man two machine' operating system, and there have been no substantial improvements except in machine downtime on the factory floor.

Although the firms examined here are similar in many ways as discussed in chapter four, there are also important differences between them

indicated at this stage. In the next chapter each research proposition will be addressed separately using the findings from the individual firms in the study.