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THE CONTROL OF TECHNOLOGICAL CHANGE IN THE MOTOR INDUSTRY : A CASE STUDY

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SUMMARY

This thesis is based upon a case study of the introduction of automated production technologies at the Longbridge plant of British Leyland in the period 1978 to 1980. The investment in automation was part of an overall programme of modernization to manufacture the new 'Mini Metro' model.

In the first Section of the thesis, the different theoretical perspectives on technological change are discussed. Particular emphasis is placed upon the social role of management as the primary controllers of technological change. Their actions are seen to be oriented towards the overall strategy of the firm, integrating the firm's competitive strategy with production methods and techniques. This analysis is grounded in an examination of British Leyland's strategies during the 1970's.

The greater part of the thesis deals with the efforts made by management to secure their strategic objectives in the process of technological change against the conflicting claims of their work-force.

Examination of these efforts is linked to the development of industrial relations conflict at Longbridge and in British Leyland as a whole. Emphasis is placed upon the struggle between management in pursuit of their version of efficiency and the trade unions in defence of job controls and demarcations.

The thesis concludes that the process of technological change in the motor industry is controlled by social forces, with the introduction of new technologies being closely intertwined with management's political relations with the trade unions.

Key words

technology
British Leyland
motor industry
unions

PREFACE

What this thesis attempts to do is in one sense quite simple. Within the bounds set by our case-study of a British car manufacturer, it attempts to elucidate and analyse the process by which technological change in industry is directed and controlled. It has the straightforward aim of unravelling that nexus of social, technical and economic forces which is at the heart of the individual firm's adoption and operation of new technologies. More specifically, it presents an analysis of the way in which the management of a major British company - namely British Leyland - first decided on a major change in production technology, then designed and introduced the new automated technology, and, last but not least, secured its efficient operation.

The case-study deals with the introduction and initial operation of automated production lines in the 'Body In White' process at British Leyland's Longbridge plant ; the 'Body In White' process being the area where the steel body-shell of the car is spot-welded together from many sheet metal body panels. The technological change here was part of a major programme of investment in modernized facilities to

produce the new 'Mini Metro' model.The Metro was launched in October 1980,but production from the new facilities began some months before that date in the summer of 1980.

The research at the plant paralleled the installation and initial operation of the new technologies, running from October 1978 to beginning of 1981.It was carried out under the aegis of a collaborative arrangement between British Leyland (BL) and Aston University, and given financial support by a CASE (Collaborative Award in Science and Engineering) Award from the SERC. It began with the fairly general aim of documenting the social and economic consequences of the advent of automation at Longbridge.Its underlying rationale at that early stage was that introduction of automated facilities would have a significant impact of both a social and economic nature upon the operations of the plant - its aim being the analysis of that impact to draw lessons for future changes in technology.

In itself this view of technology as having a strong deterministic effect upon the organization in which it is located has a degree of academic integrity. Indeed,it has been the key assumption of many academic studies in this area.However,in the first phase of the empirical research it soon became clear that the Longbridge case could not usefully be treated in this

way.It was evident,for instance,that the arrival of automation did not bring about any automatic adjustment of the social organization at the plant,nor could its economic effects be usefully evaluated at the level of a simple investment decision.In that sense,the technological change per se had little impact beyond the most practical operational level.What really seemed important was management's role in controlling the technological change,in securing the adjustments of practices and social organization which were deemed appropriate or desirable for the new technologies. Management rather than technology seemed the controlling factor,with changes in jobs,skills,work practices and organization flowing not from the technology - which was still only being installed on the shop-floor - but from various levels of management.Moreover,their role as the mediators of change and the interpreters of technical 'needs' was further underlined as it became clear that the technological change itself was in many ways less important in terms of increasing 'efficiency' (however that was defined) than the working practices that were installed on the new production lines.

Thus at an early stage the focus of the research moved away from the effects of new technology towards examining the way in such change was negotiated and controlled - seeking to place it much more in the context

both of management's control of production and the industrial relations system of the plant.

In part this need to locate and define the controlling factors in the introduction of new technology arose from the simple fact that,as only one part of the whole Longbridge site,the automated 'Body In White' (BIW) process could not be isolated from the other processes to which it was linked.These processes - first the Paint Shop,and at a later stage the Trim and Final Assembly area - remained relatively labour-intensive, and even the BIW process itself retained conventional manual methods on its finishing lines.Consequently,with, as is perhaps the general rule,no clear cut shift in technology,it made little sense to treat the plant as a model of process automation - especially when so many of the non-technical aspects of the new process were linked to events in Longbridge as a whole.

Moreover,this period was not only one of intense technological upheaval at the plant.At this time,as will become apparent from a reading of the thesis,the Longbridge plant like the rest of BL was undergoing a series of crises to do with the company's severe financial and industrial relations problems.The changes in technology were thus closely intertwined with and affected by a developing conflict between management and unions.Even the most blinkered researcher,having to

operate in this pervasive atmosphere of crisis and tension, could hardly fail to take these factors into account.

The situation was not without its own problems for a research study, and certain constraints were placed upon the research. In particular, as management-union relations deteriorated to the point of extreme hostility, the trade unions at the plant became very reluctant to cooperate with the study. Indeed, on a number of occasions and especially in the more sensitive areas of industrial relations, even management themselves were reluctant to divulge information. Although such problems were counter-balanced to a degree by alternative sources of information, they are worth bearing in mind, particularly in the reading of Chapters Eight and Nine which deal with industrial relations at Longbridge.

On the other hand, against the undoubted difficulties of carrying out the study in this politically tense climate there must be counterposed the advantages of extensive access to the plant and project management who were responsible for introducing the new technologies. Not only did this afford the most useful perspective on the way in which technological change was managed and controlled, it also provided an unusually deep insight into management plans and motivations. Apart from the interview programme which constituted the basic staple of the research - nearly 100 interviews

were conducted at the plant - much of the material in Sections Two and Three is drawn from a wide variety of internal management reports and documentation. In Chapter Seven, for example, the material on worker participation at Longbridge is derived in large part from official committee minutes. Similarly, in Chapter Nine the detail on management's strategies in dealing with the maintenance trades is greatly enriched by reference to a whole range of management documents, as well as official reports of industrial relations negotiations.

Added to the plant-based research, our discussion of the technical and economic trends in the industry world-wide is mainly drawn from a number of short visits to certain other relevant factories and research institutions. These visits furnished invaluable information on a number of important points. For example, tours of the Renault plant at Flins, Fiat's Rivalta plant near Turin, and the Ford plant at Halewood, all served to provide a much clearer picture of the way in which some of BL's major competitors developed and operated their own automated production lines. At a more general level, a visit to M.I.T. and the Harvard Business School in the U.S.A., apart from offering a useful insight into developments in the U.S. motor industry, also helped to place events at BL in the context of an increasingly competitive and integrated world industry.

Despite the wide and varied sources for the research, the thesis itself has a relatively simple structure. It begins in Section One with the theoretical, industry-level aspects of technological change. Then in Section Two it moves on to a specific focus on BL as a corporate entity ; evaluating management's control of technology, and describing the constraints imposed by the firm's system of industrial relations. Finally, in Section Three the focus moves downwards once more, this time to the level of the Longbridge plant itself. The chapters in this section not only describe the planning and design of new technology, but also outline management's efforts to achieve new working practices in their struggle with the trade unions. The thesis is then completed by the Conclusion which explores some of the implications of the Longbridge case-study.

The reader should note that notes and references for the various chapters are placed at the end of the thesis. These not only give the source of the information presented, but also in many cases some of the background to the point that is being made. A Glossary at the beginning of the thesis furnishes some definition of the technical terms used in the course of the thesis.

Finally, in acknowledging the help and assistance of many others in producing this work, I should give credit first to my supervisor, Dr. Russell Moseley whose

constant,watchful attention and encouragement has been of great value throughout.Thanks must also go to Professor Ernest Braun who developed the original basis for the project,and to my industrial supervisors at Longbridge - Mr.Mike Waldron and later Mr.Geoff Crow - who smoothed the way for conducting the research. Indeed,I must express my gratitude to BL in general and to the SERC for providing the financial support for the research.A great debt is owed also to the many managers at Longbridge who,even in periods of intense pressure, gave me some of their valuable time for interviews. Although,for reasons of confidentiality,they must remain anonymous,their comments provided a great insight into events at Longbridge,and the basis for many of the points made in the thesis.Lastly,thanks go to Peter Moran who has furnished me with a great deal of information and assistance in the course of the project.

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GLOSSARY

Body In White (BIW) : The process where the many sheet metal body panels that make up the car's body are spot-welded or gas-welded into a complete bodyshell assembly.The importance of this process is that the bodyshell forms the rigid frame into which all the other components - engine,transmission,and so on - are fitted.Until the Second World War the car chassis performed this function,and,indeed,in the U.S.A. many of the larger automobiles are still constructed around a chassis.

Body Framing : The area in the BIW process where the major sub-assemblies of the side and the floor are assembled ; being held by clamps and either manually or mechanically spot-welded.In the Metro plant,this task was performed by the Sciaky Auto Body Framing line - a combination of first multi-welders to perform the initial framing welds,and then a line of 14 robots to perform later welds.

Buffer Stores : An inter-process area where the output of sub-assemblies from one process are stored before being fed into the next sequence of production.In the New West plant the 'Tagged Body' buffer store was computer controlled.

Derivatives : Variations on a basic model type - generally modifications to the basic bodyshell,e.g. a 'notchback' with a boot as against a 'hatchback'.

Hours per car : The work study measure of productivity. It represents the number of man-hours worked per week divided by the number of cars produced that week. The industrial engineers' work standards are based on calculations of the man-hours needed per car for each process of production. Such standards serve as the basic determinant of manning levels.

Industrial Engineering : The title given to the Time and Motion or Work Study engineers at Longbridge.

Module : There were two production modules in the New West, i.e. two sets of major sub-assembly processes and two A.B.F. systems, with each A.B.F. process being served by its own linked Bodyside, Underframe and other sub-assembly processes.

Multi-welders/press-welders : Specialized machines which carry out the spot-welding/assembly of the BIW body panels. They are 'dedicated' to a particular model - i.e. they can only be used for that model and must be scrapped on a change in model.

Off Standards : A measure of inefficiency - an off standard figure represents a calculation of manning employed over manning required to meet work standards. Where twice as many men are employed as required in work standard terms that gives an off standard of 100%. Thus efficient production is represented by a figure of 0% off standards.

PLCs : Programmable Logic Controls - simple electronic controls.

Relaxation Allowance : The percentage of work time allowed for the worker to rest, meet personal needs etc.

Slipping : The extra manning required to incorporate the Relaxation Allowance, or the rest time allocated for the same purpose. On 'full slip' the line would be fully manned, including in the numbers of workers the required figure to provide the Relaxation Allowance. On 'block slip' the rest time would be provided by standing down the whole line for a certain period.

Tagging : The manual process preceding the A.B.F. where the various sub-assemblies are loosely assembled and held together with 'toy tags', so that they can subsequently be tack-welded and framed by multi-welder.

Trim and Final Assembly area : The area where the Powertrain (engine and transmission) is married to the body-shell, and where the electricals, controls, seats and so on are fitted. The most labour-intensive area of car production and relatively inaccessible to automation.

Underframe : The floor or floorpan of the car, the largest sub-assembly. In the New West the Underframes were produced from two large Kuka multi-welders. These brought together and spot-welded the various body panels that made up the Underframe.

Unimate : The name of the robots supplied by the firm of Unimation Inc., the world's largest and longest established robot manufacturer at this time.

INTRODUCTION

It is hardly necessary to provide any justification for the focus of this study. Technological change has long been an issue of great concern to the industrialized West. Indeed, especially in the 1960's and 1970's, governments have seen it as an important part of their economic policies to exhort and encourage the adoption of new technologies in industry. Moreover, recent advances in the area of microelectronics have given an added urgency and edge to this concern, such that in recent years there has been a vast outpouring of government reports and statements on the 'new technology'. All of this has served to underline the great anxiety felt by both government and industry that Britain should not 'fall behind' in what is widely seen as 'the race' to adopt new technologies and thus remain competitive in international markets. Further the very fact that one major British firm - namely British Leyland (BL) - allowed a research study to be carried out on its efforts to introduce new technologies only reinforces this point.

However, the functional 'necessity' of technological change to an industrial economy cannot disguise the fact that such change is far from being either inevitable or uncontested. In particular, the trade unions in Britain have sought to install some degree of control, or at least

constraint upon the processes of technological change. Thus whatever the costs and benefits of adopting new technologies in industry,and whatever its social or employment effects for these are beyond the scope of this study,it is at its core a process which is under social control.At least that is the primary contention of this work and one which the following chapters will attempt to justify.

At the heart of the thesis is a case-study of the introduction of automated plant and equipment at the Longbridge plant of BL.BL's investment in a new automated 'Body In White' process - which is the central concern of the present work - was part of a major programme of investment in new facilities for the 'Mini Metro'.Over £200 million was invested in Longbridge for this purpose.

Given this kind of focus for the study and its company and plant-level scope,the work might normally be bracketed with a whole body of literature on the 'diffusion' and 'innovation' of new technologies,or even with the burgeoning output of studies on the application of microelectronics.Studies in this area tend to be concerned with the managerial problems of assimilating and introducing sucessive waves of new technologies,and of overcoming the various 'barriers' to innovation such as the 'perception' of management or the 'attitudes' of labour (1).However,while the

present work does place great emphasis upon the role of management, it seeks to do so in a way which is not partial in either sense of the word. That is, it attempts to locate management in their social role as the primary controllers of technological change, without at the same time giving uncritical acceptance to the managerial frame of reference for such change. Management's efforts to introduce new technology are viewed less as a matter of adjusting to the inevitable forces of technical 'progress', and more as a sectional or political enterprise in which management not only strive to overcome the social obstacles to their own plans for change - notably in the form of trade union job controls and demarcations - but also, and in some ways more importantly, seek to ensure that their own conceptions and standards of efficiency are secured by the change in technology.

It follows from this that just as the thesis takes a qualitatively different view from the majority of studies on innovation, equally it should also be set apart from much of the mainstream sociological and industrial relations work in this area. Without stressing over-much the deficiencies in the typical sociological view of technology, it seems that as a general rule the process technology of the plant or the organization is treated as a given or static factor in the situation, something which may or may not have have effects on job content, worker behaviour and so on. Even the exceptions

to this rule, works, for instance, such as Woodward's 1970 study (2) which treat technology as a more dynamic element in the organization, tend to neglect the social processes of control over technological change. Thus there are few, if any, studies which view process technology as anything more than a kind of exogenously-imposed variable, a factor over which either no-one or perhaps only management can exert control. This deficiency in the literature seems to be most serious in the field of industrial relations. Although studies here certainly acknowledge the processes of social conflict and control, they seem to have no adequate frame of reference for dealing with technological change at plant level. Typically, where technological change is a 'salient' issue in industrial relations terms it is awarded the status of just another bargaining issue, or placed in the category of 'productivity bargaining' (3). The special character of negotiations on technical change is rarely acknowledged, and where changes in techniques and methods do not surface as bargaining issues then, despite the fact that such changes may have profound effects on management-worker relations, they tend to be ignored. Thus to deal with technological change as a central rather than a peripheral concern is to adopt a novel approach which could not be comfortably located anywhere within the existing literature. This is not to say, however, that studies from

other academic disciplines have no relevance whatsoever to the present work, for a great deal of contextual material and many important insights have been gleaned from a whole range of sources and are incorporated in the thesis.

In part, the novelty of the perspective outlined here is the result of our methodological approach to the analysis of technological change. Basing the work on a single case-study involves an implicit acceptance of some of the inherent limitations of this method. For example, it is not within our ambit to examine the sources of invention, the scientific and technical impetus behind technological change. Equally, it is difficult within the case-study format to measure and account for the diffusion of technologies in the industry as a whole.

However, accepting these limitations and having defined what this thesis is not, it must be said that there are certain virtues in the case-study and certain aspects of the thesis which it is perhaps worthwhile recounting at this point. Firstly, one of the major elements of the case-study is the importance of management's role in guiding and controlling both the technical processes of change and the social components of new methods and practices. The managerial role here is counterpointed by the theoretical discussion

of Section One. In particular, the first chapter on the 'Management of Technological Change' examines the managerial control of technology by contrasting it with the various arguments which explain technological change in terms of certain broad exogenous forces outside management's control.

One important strand in the discussion is the view that technological change in industry is largely the product of economic factors ; Langrish, for instance, claims that changes in techniques and methods are mainly attributable to the forces of competitive attrition - a kind of 'Technological Darwinism'(4). On the other hand, there is a strong tendency in the literature, most vehemently expressed by Ellul, to the effect that changes in technology are the outcome of an intrinsic technological dynamic (5). But perhaps the most plausible of the arguments for locating the control of technology outside the individual organization are those which link technical factors to economic and financial ones - in, for instance, a stress on the importance of 'economies of scale' in industry. This kind of view is best expressed in the 'product-process life cycle' model put forward by Utterback and Abernathy (6).

However, whatever the plausibility of such views, an examination of the oligopolistic structure of competition in the motor industry yields two major

pointers to the importance of management's role - both being underlined in later chapters by reference to events at BL.In the first place,as writers such as Galbraith have pointed out (7),managements seem to have a large amount of discretion in the conduct of their enterprises. Economic pressures may constrain but do not coerce management into adopting new technologies - indeed it is management's very discretion which gives rise to so many of the problems of innovation.Secondly,for any large-scale change in technology management's decisions are seen to be taken not with regard to the economists' view of efficiency,nor upon the anvil of technical progress,but rather in the light of the overall strategy of the firm.Child's notion of 'strategic choice' (8) seems to be particularly relevant here as a means of explaining and analysing this process of managerial decision-making.Moreover,Chapter Three,which surveys technological change in the motor industry as a whole, provides some useful empirical support for this point ; the introduction of new technologies such as industrial robots is seen to be closely linked to the strategic undertakings of the major firms.

In Section Two of the thesis,the notion of the strategic control of technology is taken up and expanded further with reference to BL's 'strategic choice' of investment for the Mini Metro.As our analysis shows,the original decision to invest was a matter of neither

technical nor economic pressures tout court, but the result of a strategic decision on the part of both the Government and BL management. Thus the impetus behind the changes at Longbridge needs to be located within the general development of both the structure and the strategy of BL.

Chapter Four of the thesis, 'British Leyland and the Market', attempts to do just that by tracing BL's historical development, and highlighting the linkages between the growth of BL as an organization and the kind of strategic possibilities that this created for management in the 1970's. Obviously a question of major concern here is BL's decline during the 1960's and 1970's - from being the foremost British car producer to a position of heavy reliance on government aid. The effect of this decline on the firm's corporate strategies further underlines, in fact, the complex interrelationships between the economic performance of the firm and its investment in new technologies. In particular, the importance of the technological change at Longbridge can only be fully gauged by reference to the place of the 'Metro' model in BL's corporate strategy - and especially as a crucial component of the rationalization programme undertaken by Sir Michael Edwardes.

Moreover, the changes in production technology at Longbridge do not only need to be viewed in the light of BL's corporate strategy. The strengths and weaknesses

of the investment at Longbridge are best evaluated in terms of some of the corporate strategies adopted by other major manufacturers.A comparison between the production policy behind the 'Metro' and the so-called 'World Car' strategies of multinationals such as Ford bears some interesting and revealing results,and these are noted in some detail in Chapter Four.

Further,in the following Section of the study, Chapter Six on the 'New technology at Longbridge' reveals some of the direct links between strategy and technology.It demonstrates that the original policy commitment to producing a new small car at BL did not only act as the initial stimulus to a change in technology,but that at the most detailed level of the new facilities management's competitive strategy shaped and moulded the design of the production technology.Although technological factors were certainly of great importance in design,in the broadest sense they were firmly in the service of certain overriding strategic and economic considerations.

Yet,all this emphasis on the role of management and their strategies should not be taken as implying that their control of technological change is entirely undisputed or impartial.If this were the case then economic factors would rightly be seen as having a deterministic influence - if only via the neutral arbitration of management.But this was clearly not the case at Longbridge.Here management themselves underlined the crucial part played by labour in their concern for the

behaviour of the work-force and its influence upon the benefits that management sought to secure from a change in technology.This was not only a matter of increasing productivity levels by obtaining the workers' adaptation to a new technical framework.Rather management's ability to secure planned levels of output and quality depended on its strategies for achieving the work-force's subordination to the new technical rationale of production.

In one sense management's efforts here were to do with the imposition of a new technological form of control upon the workers in the BIW process - limiting the discretion even of the maintenance groups by various technical devices.In this the managerial strategy corresponded closely with the view first put forward by Braverman and subsequently refined by other writers such as Edwards and Friedman (9) ; namely,that capitalist managements seek to secure an ever increasing degree of control over the production process by a constant flow of de-skilling techniques,and other means of reducing worker discretion.Certainly,as is described in Chapter Nine,BL management and engineers did try to reduce or suppress the level of maintenance skills in the new BIW plant - by,for example,the installation of diagnostic technologies and ensuring the utmost simplicity in maintenance procedures wherever possible.

However,while the theoretical model outlined by

Braverman is one of the few that has direct relevance to the present work, it does demand serious qualification before it can be usefully applied to events at Longbridge. For example, the Bravermanite model operates upon such a level of generality that it is difficult if not impossible to apply to an individual case study without rendering the whole exercise in some way trivial. More important even than that, however, is the fact that in terms of the actual events at Longbridge Braverman's emphasis upon de-skilling seems largely inappropriate, even mechanistic.

This was most clearly the case in management's struggle with the production work-force for control of the technological change. The struggle took place on a terrain that is normally associated with the day-to-day issues of collective bargaining ; working practices, demarcations, custom and practice, and so on. Although the production workers had few, if any skills to defend against the incursion of the new technologies, their accumulated job controls and job rights represented a political constraint on the plant's productive efficiency which management found unacceptable. Hence management's search for higher levels of output and productivity from the new automated facilities involved them in a process that was more political than technical in its methods and objectives.

The political aspects of this process were so deeply rooted in BL's social structure and history that they need to be located first within the overarching framework of the evolving system of industrial relations at company level.This task is taken up in Chapter Five, 'Industrial Relations at British Leyland'.Perhaps the most important conclusion of this chapter for our purposes is that management's strategy and its criteria of efficiency are secured not at shop-floor level alone, but firstly and primarily within the industrial relations system of the firm as a whole.In particular,at BL they were bound up with the network of formal and informal relations between management and unions.These are seen to have placed important constraints upon management's command of production.

The removal of such constraints on efficiency seems to have rested on management's ability to subordinate the conduct of industrial relations to the company's economic 'needs' - and especially to the overriding question of labour productivity.After several attempts, management's eventual success in this aim,in a conflict with the trade unions,was the result not of the abortive creation of a system of worker participation,but of the coercive effects of BL's economic crisis.

The implications of this corporate level conflict for management's plant level pursuit of efficiency and control of technological change are detailed in Chapters Eight and Nine.These chapters serve to demonstrate that

managerial tactics and strategies towards this end varied widely in character.But all the attempts to secure the hoped-for efficiencies were closely intertwined with,on the one hand,the technical processes of change,and,on the other, the slowly unfolding economic crisis which enveloped BL at this time.

The first phase of management effort was bound up with the construction of a system of worker participation in BL.It involved an attempt to win over the work-force to an acceptance of managerial values and objectives;or in the rhetoric of that period,an attempt to change the workers' 'attitudes'.At Longbridge,in particular,it entailed giving the Longbridge work-force some involvement in the design and implementation of the new technologies at the plant,in return for their 'objectivity' and commitment to change.The implications of this exercise,especially for the possibility of trade union control or influence upon technical design, are discussed in greater detail in Chapter Six.

The second phase of management's campaign centred on the negotiation of changes in working practices,thus bearing comparison with the kinds of productivity bargaining documented by Flanders (10).Such a comparison could only be very limited in character,however,for above and beyond the dynamics of management-union bargaining an important and ever-present factor was the new technology itself,which appeared as both an objective and an

ideological centre-piece of the negotiations.

Eventually,as noted in Chapter Eight,both the above-mentioned strategies collapsed ; the pressing technological 'necessity' of changes in practice being overwhelmed by a massive shift in management-union relations,the outcome of BL's precarious and increasingly critical financial and economic position.At this point,participation and persuasion gave way to coercion, with management employing various intimidatory tactics to impose the desired changes and secure the planned efficiencies on the new automated lines.Under the new managerial regime at Longbridge,which was imposed in early 1980,management attempted to grasp the benefits of technological change by the political subordination of the trade unions.There was a wholesale programme of dismantling the unions' controls and constraints upon production,work standards were tightened and production efficiency raised.The overall effect served to underline the managerial values and efficiency objectives that underlay technological change at the plant,at the same time reinforcing the view that managerial control of such change rested ultimately upon their ability,by whatever means,to secure the subordination of the work-force.

Thus by the end of the thesis,it seems that the most conclusive evidence for the predominantly social or political nature of technological change comes,ironically,

from the period when management's 'prerogative' and its control of technological change was at its most secure and untrammelled.

The general flow of the thesis encompasses many different issues, technical, economic and political. However, it does follow a fairly coherent theme with each chapter leading logically into the next. It begins in Section One with the theoretical questions of technical change, seeking to locate the social control of such change in a theoretical context - against, for instance, the contrary claims of the economists or the engineers. The conflicting roles of both management and labour are examined, and Chapter Three attempts to provide a brief analysis of how those roles have been played out historically in the motor industry. Section Two deals with BL at a corporate level ; on the one hand, the development of the corporate strategy which the 'Metro Project' was designed to serve, and on the other the firm's system of industrial relations which slowly but inexorably came to stand as the greatest obstacle to the achievement of such corporate strategies. Finally, in Section Three, the analysis moves down to plant level, dealing first with the technical aspects of the new BIW process and their links with management policy. Then in the following chapters the interplay of industrial relations and technological change is discussed in some

detail.In Chapter Seven 'Worker participation in technological change' is discussed,raising such questions as,for example,to what degree trade unions can exert an influence over technical design.Lastly,in Chapters Eight and Nine the stormy period of 1978 to 1980 is dissected in terms of management-worker relations at the plant and to what extent they influenced technological change and vice versa.It is in these chapters that the artificiality of the division between technical and social factors is most apparent - with management's most obscurely technical endeavours being seen to rest on the power balance between management and unions.

SECTION ONE

THE CONTROL OF TECHNOLOGY : THEORETICAL VIEWS

CHAPTER ONE

THE MANAGEMENT OF TECHNOLOGICAL CHANGE

The Economics of Technological Change

Whatever the social and political forces involved in technological change, by and large the predominant frame of reference for such change is economic in character. Within business organizations, for example, changes in technology are justified largely in terms of their economic consequences ; particular calculations of cost and benefit, return on investment, and so on. Thus, the economists' viewpoint seems to furnish the natural starting-point for our attempt to disentangle the various elements involved in the introduction of new technology.

However, having said that, even the most superficial survey of the relevant economic literature (1) reveals that to place any reliance on this perspective is to court disappointment. Pure neo-classical economic theory, when applied to technological change, seems to be intrinsically limited in its scope. It views changes in technique and machinery in the most simplistic terms, defining them as a shift in the 'production function' of the individual firm or industry ; that is, a higher output for the same combination of inputs. It has little to say, for example, about those changes in production that entail

variations in the combinations of capital and labour inputs,which would be reckoned as technological change by most empirical criteria.So great are the limitations of this approach in fact,that Rosegger,for one,concludes that "the theory of production and technological change raises many more questions than it can answer" (2).And Kay suggests that the "application of the neo-classical theory of the firm..(is)..of limited and indeed questionable utility in the area of technological change" (3).

The neo-classical viewpoint is not only very narrow in its theoretical scope,but is also heavily constrained in empirical terms by the problem of what Rosegger terms 'technological specificity' (4).This he describes as follows :

> "..the fact that,in a more or less definable sense,each plant represents a unique combination of capital equipment,embodying technologies of various vintages,and imposing very special constraints on decisions at the margin." (5)

As a result,for the same change in technology or method "effects might even differ across firms in the same industry" (6).

Thus,for both theoretical and empirical reasons, it seems evident that the economists can offer us no useful general model of technological change.However, this is not to say their perspective can provide no useful contribution whatsoever.At the very least,inasmuch as technological change is predominantly justified in terms of economic 'payback','net present value' calculations and so on,economic theory can usefully enlighten

us as to the form of rationality employed in such decisions (7).

More specifically,there appear to be a number of economic phenomena operating within industry which exert an influence on technological change in a fairly direct manner.It seems likely that economic theory will provide us with the greatest insight if we focus upon these production-based phenomena.We propose to deal with them under three major headings ; product-process linkage,economies of scale,production specialization.

a) Product-process linkage

Despite the inadequacy of neo-classical theory, the literature on technology reveals a number of attempts to provide some analytic structure to the complex relationship between technological change and economic forces. For example,Langrish puts forward an argument for 'Technological Darwinism' (8),in which the direction of technological change is viewed as the effect of the competitive market pressures within and between nation states,and the resulting survival of the most economical technologies.Probably the most cogent of the arguments in favour of a direct relationship between economic factors and technology comes from Utterback and Abernathy (9).They take Langrish's view one stage further by presenting a systematic formulation of technical change in industry in terms of a 'characteristic evolutionary pattern' (10).Abernathy describes this pattern as resulting from the linkage between the production process and the product :

> "As the product and the manufacturing process develop over time,costs decrease, product designs become more standardized, and change becomes less fluid...production processes,designed increasingly for efficiency,offer higher levels of productivity, but they also become mechanistic,rigid,less reliant on skilled workers,and more dependent on elaborate and specialized equipment." (11)

In essence,Utterback and Abernathy relate the development of industrial processes to the growth and subsequent maturity of the product's market.The 'product life cycle' influences technological change via possibilities for product standardization,process specialization and economies of scale.

According to their model,production systems develop through three major stages,in parallel with the state of development of the related product market.In the initial growth stage,production is on a fairly small scale and tends to be oriented towards product characteristics rather than product cost.As a result of the size of the market and the nature of competition within it,manufacturing processes tend to be 'uncoordinated' and labour intensive in character. However,as the product market grows the manufacturing process typically evolves into the 'segmental' stage, with greater elaboration of production methods and a certain degree of automation and mechanization in particular sub-processes.Finally,as price competition becomes ever more intense and the product reaches maturity,production processes reach the 'systemic' stage ; integrated,automated and highly product specific, securing minimal product costs (12).

This argument for a particular pattern of technical development in industry is well supported by empirical research.Not only is Abernathy able to make copious reference to the history of the U.S. motor industry to support his view,but a large-scale survey by Myers and Marquis (13) seems to lend it an added degree of empirical validity.Clearly,in highlighting the importance of the linkage between product and process,these two authors have identified a major factor bearing upon the direction of technological change.Moreover,their typology of production systems receives a great deal of support in the literature,and is closely paralled by the analysis of Woodward (14).

Yet,while the model itself seems to possess a high level of plausibility,the Utterback and Abernathy analysis seems less sure-footed in identifying the underlying causes of their well-documented 'evolutionary pattern' of technical development.Certainly,the linkage between technology and product life cycle seems plausible, but in turn it only seems to beg the question of whether the life cycle itself possesses some autonomous dynamic. And,if so,how are we to identify its various stages without referring back to the manufacturing process itself ? A further objection to the Utterback and Abernathy view,and an important one,is that the 'patterns' and 'trends' that they describe seem to be presented as the natural effects of the impersonal forces of competition.Yet,the U.S. motor industry on which Abernathy

bases much of his argument actually shows an extremely high degree of concentration (15),being dominated by just three manufacturers ; General Motors,Ford and Chrysler.Given that one of the characteristics of an oligopoly is the degree of choice available to the major firms,it seems unlikely that simple competitive attrition would have the same deterministic effect on technical change as seems to be suggested by the 'product-process life cycle' model.Thus,for the the Utterback and Abernathy analysis to carry greater theoretical as well as empirical weight,it needs to demonstrate in much greater detail the degree of choice and determinism involved in the product-process linkage.

b) Economies of scale

The need to achieve economies of scale is consistently cited (16) as one of the most important factors bearing upon the development of process technology within the motor industry.Abernathy,for instance,cites the need to achieve such economies as one of the major factors underlying the development of process specialization and mechanization.However,despite the significance attached to this phenomenon,there is comparatively little consensus on either the precise value of such economies or on the production levels at which they are attained. Estimates of the 'minimum efficient scale' (17) in car manufacturing vary from 250,000 cars per annum to one million and above.Quantification is further complicated by both chronological changes in the minimum scale and variations between different manufacturing processes.

Dunnett,for example,claims that the 'minimum efficient scale' in the industry rose from 500,000 per annum in the 1950's to one million in the 1960's,and beyond one million in the 1970's.

In effect,the problem seems to centre upon two factors ; firstly,the diversity of sources from which scale economies flow,and secondly the intrinsic difficulty of relating the firm's overall efficiency to the technical aspects of production.One useful way of dealing with this problem,however,is to make a clear distinction between what we will call 'technical economies' of scale and 'commercial economies'.By defining the former as "the reductions in unit cost deriving from higher output within a single plant",we can largely isolate the influence of purely technological factors from the other aspects of scale.'Commercial economies',on the other hand, are taken as encompassing all those economies associated with scale that are non-technical in character - for example,the firm's ability to spread advertising costs.

While 'technical economies' seem to have a 'minimum efficient scale' of around one million units per annum in the motor industry,estimates for 'commercial economies' in areas such as research and development and advertising seem to be of the order of anything up to five million units.Thus,the intrinsic technical efficiency of higher levels of production (mechanization,lower tooling cost, and so on) seems to be less significant in determining the scale of operations than non-technical considerations. There are,as Pickering notes (19),a number of ways of

reducing costs within the firm as a whole which are only tenuously related to manufacturing operations.For instance, a large firm may find it easier to meet market demand by being able to transfer supplies from one plant to another. Or it may find that it has fewer problems in recruiting and retaining high quality staff.Equally,the large firm is likely to enjoy economies in trsnsport and distribution,as well as significant advantages in purchasing raw materials and acquiring capital.

There seems little doubt that in large part the overall economies of scale in industry are derived not from technological advantages gained by long production runs,but from sheer size.Bannock reinforces this view ;

> "Technical plant economies of scale,it may safely be concluded,do not in themselves provide any justification for even the present level of concentration in most industries and still less for the continued growth of the mature corporation." (20)

The need to achieve economies of scale seems to be less of a technical than a commercial imperative.Further, given the predominance of 'commercial economies' over technical factors,it seems apparent that the 'efficiency' secured by firm size must be evaluated in terms of competitive standards rather than technical ones.The market power secured by firm size must be regarded as contributing to the overall efficiency of the firm's operations to the extent that it gives a competitive edge over other firms and aids survival.Stigler,for instance, defines the relationship between efficiency and size in the following way :

> "An efficient size of firm...is one that meets any and all problems that the entrepreneur actually faces ; strained labor relations,rapid innovation,government regulation,unstable foreign markets,and what not." (21)

Thus,as he notes,

> "..the most efficient size of firm may arise from posession of monopoly power, undesirable labor practices,discriminatory legislation etc." (22)

'Efficiency' is determined not by technical factors,nor by the pressures of the 'perfect market',but rather by what is successful within a particular market.The competitive importance of the kind of market power described by Stigler is further emphasized by Rhys (23) who notes that,in the U.K. motor industry,the larger firms remain in an advantageous position whether they compete through either price or model style.Moreover,as Ensor points out (24),in the U.S. motor industry profits (and more recently losses) have regularly been ranked in favour of the largest firms.

It seems clear,then,that the search for efficiency by the exploitation of scale effects is more to do with the achievement of market power than with the technical advantages of scale.As a result,such economies cannot be reckoned as a technical imperative in the development of process technology.Rather,consideration of the economies of scale within the car industry - especially their link with market power - only underlines the above-mentioned need to integrate the notion of choice into our analysis.

c) Production specialization

It is a central premise of the Utterback and Abernathy model that production systems tend to become increasingly specialized and product-specific over time. Abernathy's main conclusion about the U.S. motor industry, for example,is that the industry has developed such highly specialized and rigid processes that they are now counter-productive,constituting a 'roadblock to innovation'.

However,while process specialization certainly may confer cost reducing advantages in production,in the context of the motor industry the major firms' drive to achieve such benefits does not seem to be simply or even largely a matter of market imperatives.On the contrary,it seems to rest more upon the firms' ability to override market forces.Galbraith,for instance,makes out a strong case for the view that the primary objective of the major car firms is not so much to respond to the market,as to subordinate the uncertainties of market demand to their own planning of operations (25).

Given the relatively capital-intensive nature of the motor industry,one major effect of market uncertainty is that any investment in specialized facilities carries with it a significant element of risk,inasmuch as the facilities are 'dedicated' to a particular model.The possibility of a model failing to attract sales thus represents a potentially great constraint upon investment in process technology.Indeed,White claims that :

> "The length and nature of the lead time required between design and sale,and the costs of the design and development process...are crucially related to the risks of automobile production." (26)

But,despite the intrinsic uncertainty of marketing and production,the major producers in the industry possess several means of reducing the constraints that it places on their activities.One of the most effective 'solvents' of uncertainty,as Galbraith notes (27),is sheer organizational size and market power.Galbraith suggests that :

> "The size of General Motors is in the service not of monopoly or of the economies of scale,but of planning..control of supply, control of demand,provision of capital, minimization of risk.." (28)

So vital is the minimization of risk,that it can be seen as the most important criterion for judging the optimum size of firms (29).It seems that the greater the investment in specialized processes,the more important it is for the firm to possess sufficient market power to accept the scaled-up risks.For the major manufacturers the application of market power in easing this problem seems to involve the creation of market 'segments' ; in each 'segment' models or model types are designed to appeal to particular groups of consumers. Not only does this practice give greater stability and continuity to demand for the firm's model range,but it also raises the industry's 'barriers to entry' even higher.Additionally,the wider a firm's model range,the more widely its risks are spread and the more it is protected against market fluctuations.Major firms can

thus be more certain of their future market-share because in part this becomes a function of their existing share.As Hutchins notes,

> "The typical car buyer pays particular attention to general repute,and with difficulty in judging the quality of the product attributes great importance to existing market success.." (30)

In sum,the technical advantages to be gained by specialization in production seem to be most accessible to those firms who are able to exercise a significant degree of control over the market,and thus reduce market uncertainty and risk.As a result,the market power of the major manufacturers - as buttressed by segmentation and specialization - appears to be the product of neither technical nor economic considerations,as much as the effect of firm size,and the shift from free market competition to what Bannock calls "rivalry under the new industrial order" (31).

Management Strategy and Technological Change

Perhaps the most important conclusion to be derived from the above survey of the economic characteristics of the motor industry is the extent to which they are the effect and not the cause of the market power and size which typifies the major world manufacturers.Economic phenomena such as economies of scale and process specialization stand out not as the constraints imposed by the market,but rather as certain of the competitive weapons which may be adopted by the largest firms.The actions of the motor industry oligopolists thus seem

to reflect not their subservience to market forces,but their degree of market control.Galbraith describes the possible extent of such control in the following passage :

> "Control of prices is only a part of market control,if uncertainty is to be eliminated there must also be control of the amount sold.But size also makes this possible.It allows advertising,a well-nurtured sales organization and careful management of product design which can help to ensure the needed consuner response." (32)

Given this kind of market power,the version of efficiency which the major firms pursue is defined neither by the technical features of production,nor by the economists' view of efficiency,but simply by the overriding need to achieve long-term profitability. One consequence of this is that the the control of technological change within the major producers must be seen,firstly,in terms of their <u>choice</u> of technologies. Secondly,it must be located within the firm's search for profitability and market power,and the criteria of efficiency that it engenders.Baran and Sweezy underline this point by noting that :

> "Whereas in the competitive case no-one, not even the innovating firms themselves, can control the rate at which technologies are adopted...It is clear that the giant corporation will be guided not by the profitability of the new method considered in isolation,but by the net effect of the new method on the overall profitability of the firm." (33)

It seems evident then,that in the case of oligopolistic industries,such as the motor industry,the choice of process technologies is integrated into the

planning arrangements of the firm as a whole.This insight leads directly to the conclusion that in analytic terms the major car producers' control of technology appears to fall neatly within the scope of the theory of 'strategic choice' as proposed by Child (34).In its essentials,Child's view is that the corporation takes its decisions and exercises its choice with constant reference to its broad,overall objectives.More importantly, the choice available to the organization does not simply express its response to social and economic constraints, but is actually engaged in purposeful interaction with these external forces.Child thus emphasizes the degree of choice exercised by the corporation :

> "'Strategic choice' extends to the context within which the organization is operating, to the standards of performance against which the pressure of economic constraints has to be evaluated,and to the design of the organization's structure itself." (35)

By highlighting the degree of discretion available to management,extending even to the concept of 'efficiency' against which decisions are measured,Child has clearly pinpointed an important factor in the consideration of technological change.For example,in another context Meyer,Corner and Parker note that :

> "Competition is rarely so stringent that companies must adopt the current 'best' techniques rapidly or be eliminated. Managements have a large element of discretion." (36)

In the case of a capitalist business organization, however,the extent of managerial choice is clearly not so wide that it can override the prevailing economic constraints,or detract from the goal of long-term profitability,

In this sense,the notion of 'strategic choice' seems to represent the firm's mobilization of the advantages of size in the service of its long-term planning.For,as Edwards notes,

> "..advantages of size that accrue in the form of increased market power,rather than of technical economies,are not automatic ; potential market power must be translated into effective market power." (37)

One important result of adopting Child's analysis is that the direction of technological change at plant level can be more securely linked to the management of the firm as a whole.The degree of choice involved in technological change,and the criteria of efficiency which such change embodies,are seen to be the product of the strategic decisions taken by management.As Child explains,

> "..rather than the technology possessing 'implications' for effective modes of organizational structure,any association between the two may be more accurately viewed as a derivative of decisions made by those in control of the organization regarding the tasks to be carried out in relation to the resources available to perform them." (38)

'Strategic choice' usefully expresses the way in which managers mediate between economic and technical considerations in making their decisions on technological change.To underline this,Rosenberg makes the important point that,as regards technological change,

> "..the ultimate incentives are economic in nature ; but economic incentives to reduce cost always exist in business operations,and precisely because such incentives are so diffuse and general they do not explain very much in terms of the particular sequence and timing of innovative activity." (39)

Evidently,the 'sequence and timing',and perhaps even the direction of technological change within firms is heavily influenced by the internal behaviour of management as much as by the external economic and technical pressures.

In the first instance,then,the introduction of new technology seems to be bound up with the way in which management perceive and assimilate the technical possibilities in their environment,in the light of their overall goals and strategy.So critical is this first stage of technological change,in fact,that it receives a considerable amount of attention in the literature on 'innovation'.Freeman,for instance, has suggested that one useful approach to understanding innovation is "to look at the various strategies open to a firm when confronted with technical change" (40). Utterback emphasizes the prompting role of the firm's environment :

> "..an economic environment in which needs are clearly defined,as opposed to being heterogeneous or diffuse,will tend to stimulate technical innovation in firms." (41)

And,finally,Nabseth concludes that :

> "..the least tangible factor..is likely to have the greatest impact on the application of new techniques - the attitude of management." (42)

Beyond the sphere of managerial 'perceptions' or 'attitudes',however,the introduction and use of new technologies is closely linked to the formulation and application of strategy within the individual firm.In accord with Child's analysis,three major levels of

strategy can usefully be defined ; market strategy, organization strategy and production strategy.Reference to the development of process technology within the motor industry indicates the significance of strategic decisions at these levels.

The firm's market strategy is clearly predominant in shaping the overall direction of the firm's evolution, inasmuch as it encompasses the firm's efforts to secure its long-term future by protecting its market power and responding to competitors.The link between market strategy and process technology is most evident in the form of managerial decisions on model change,the number of model derivatives,the length of production runs,and so on.Moreover,to the extent that the 'product-process linkage' influences technical development,market strategy also has a long-term effect upon the timing and character of technological change.Even Abernathy,for example,is forced to concede that "when a few firms control most of the market,their competitive strategies are of overriding importance in determining the course of technological progress" (43).

Organization strategy here refers to the way in which the firm organizes production : its degree of vertical integration,distribution of manufacturing processes,location of plants etc.This element of strategy seems to have played an important part in the motor industry,both because of the complexity of car production,and the drive to achieve economies of scale.At this level,then,strategy in effect mediates between marketing

and production considerations.As Child notes,it will involve an attempt to

> "..establish a configuration of manpower, technology and structural arrangements which is both internally consistent and consistent with the scale and nature of operations planned." (44)

An historical example of the link between organization strategy and production comes from Overy,who claims that the re-organization of production at Morris was a critical element in the firm's success :"Organization provided the key to the improvement of Morris Motors' fortunes". (45).Moreover,Abernathy cites as a crucial influence upon technological change in the U.S. motor industry post-war the fact that :

> "..cars have been allocated to plants in a much different manner,changing the assembly plant as a production unit from a general purpose facility to one that is specialized to a particular vehicle." (46)

At the lowest level in our proposed hierarchy of strategies comes the production strategy which seems to be largely a function of the firm's overall competitive strategy.As Child explains,

> "The prevailing technology is now seen as a product of decisions on workplans, resources and equipment which were made in the light of certain evaluations of the organization's position in its environment." (47)

However,while production strategy is basically a matter of the translation of marketing or organizational goals into technical arrangements,these must always find expression within the prevailing technical and political constraints.For example,one of the principal technical

constraints upon managerial action is the general requirement for control, order and predictability in the development of production systems. Overy notes of the introduction of mass production at Morris that it,

> "..guaranteed nothing unless it was carefully planned and arranged so that materials were supplied when and where needed, machines were set up in the most efficient site on the factory floor, and the workforce was disposed so as to reduce to a minimum the amount of time worked per unit of output." (48)

Strategy and Politics

In presenting an analysis of technological change from the economists' standpoint, our discussion has highlighted the significance within the motor industry of the degree of market power possessed by the major manufacturers. Given that in this context, neither technical nor economic forces seem to exert a direct or determining influence upon technological change, the control of technology within the car firms seems to be closely bound up with a managerial process of decision-making. A tentative conclusion at this stage is that the 'strategic choice' of management seems to provide the most useful explanation of the character and timing of technological change.

For our purposes, the essential significance of this perspective is that it emphasizes the role of choice as against determinism in the process of technological change. Furthermore, the way that objective factors in such change are mediated by the perceptions and plans of managers

suggests that the control of technological change is basically two-fold in character.One aspect of this control is the rational and calculated linkage between an organization's technology and its strategy.This involves the technical and economic rationales of investment and 'innovation'.Clegg seems to touch upon this aspect when he notes that,"organizations pursue a 'mode of rationality' as something constructed by their managers in the way they orient their actions towards the ideal of profitability" (49).

However,in itself this 'mode of rationality' expresses only one dimension of management's control of technology.For as Weber notes in a discussion of bureaucracy in general ;

> "..it is not sufficient to consider only the purely formal fact that calculations are being made on grounds of expediency by the methods which are amongst those available technically the most nearly adequate. In addition it is necessary to take account of the fact that economic activity is oriented to ultimate ends of some kind." (50)

The 'ultimate ends' in this case are the goals of long-term profitability and market power pursued by the firm, together with the political values which such goals embody.Thus,a second aspect of technological change is to do with the sectional or ideological values towards which the managerial control of technology is directed. As Child notes ;

> "..when incorporating strategic choice in a theory of organization,one is recognizing the operation of an essentially political process in which constraints and opportunities are functions of the power exercised by decision makers in the light of ideological values." (51)

The implications of this two-fold character of technological change are of great significance, both in a theoretical sense and in view of the empirical material which will be presented in later chapters. For the time being, however, we can note of the process of technological change that, while it involves what Weber calls the 'formal rationality' of managerial planning and strategy, underlying the change are strategic goals, which express certain qualitatively political values - 'substantive rationality'. (52). In effect, the adoption and application of new technology is rooted in the intertwining of an objective technical or economic rationale with the more political or sectional enterprise of securing the capitalist managerial values which motivate the change.

Thus, quite apart from the construction of managerial strategy, in the final analysis management's role in implementing technological change depends upon its political relations with the work-force. Management's ability to secure the acquiescence of the workers takes on a critical aspect, the full significance of which will be explored in the next chapter.

CHAPTER TWO

TECHNOLOGY AND LABOUR

Technology and Control

In the management of technological change, the relationship between management and workers is of crucial importance. In a fundamental sense, management's ability to implement its strategy for change depends upon its command of the labour-force. As Mandel notes ; "What makes planning possible is the actual control that the capitalist has over the means of production and the labourers in his enterprise." (1)

Moreover, the importance of the managerial control of labour is not simply a matter of securing a dominant role for capital in the business enterprise (2). At the point of production, management are faced with a problem first described by Marx of actually converting labour power purchased into productive labour. For, as Behrend notes,

> "The lack of precision of the employment contract means that the standards of effort which are adopted in practice lie somewhere between the highest level which an employee can reach and the lowest level which an employer toerates." (3)

Some form of social control is thus the inevitable corollary of labour's commodity status. It also follows that a consistent and important aspect of the capitalist control of production has been the exploitation of technological devices for securing, in Marxist terms,

the 'real' as against the 'formal subordination' of labour. Indeed, as early as the mid-nineteenth century Andrew Ure was extolling the virtues of technology as a potential weapon against the working-class ;

> "..whenever a process requires peculiar dexterity and steadiness of hand, it is withdrawn as soon as possible from the cunning workman, who is prone to irregularities of many kinds, and it is placed in the charge of a peculiar mechanism, so self-regulating that a child may superintend it." (4)

Ure laid it down as a general principle that "when capital enlists science in her service the refractory hand of labour will always be taught docility" (5). Subsequently, this kind of insight has served to inform the rather less enthusiastic Marxist critique of capitalist technology. For example, Palloix outlines the Marxist position by emphasizing the social relations which are built into production machinery :

> "The tool integrated into the system of machinery becomes a 'machine-tool' ; a machine which incorporates social relations. Machinery is not neutral because the machine incorporates in its mode of operation the dexterity and skill of the individual worker who is henceforth deprived of his skill and subordinated, from the point of view of social production, to the machine which he can only serve, set in motion and regulate." (6)

Perhaps the best exposition of the Marxist view comes from Braverman in his book 'Labor and Monopoly Capital' (7). Although many writers have developed variations upon Braverman's theme, his original work still seems to represent the best and most straightforward

presentation of this important theoretical point.The essence of his argument comes in his description of the development of process technology by capitalist enterprises from the late nineteenth century onwards.He outlines a model of technological change in which the predominant tendency is the drive by capitalist managements for an ever greater and more comprehensive control of the production process.First in the techniques of Scientific Management,and then in the evolution of machinery and automation,Braverman traces the intertwining of social controls and technical progress.He claims that ; "Machinery offers to management the opportunity to do by wholly mechanical means that which it had previously attempted to do by organizational and disciplinary means" (8).For Braverman the managerial search for 'real subordination' of labour is intrinsic to capitalism,inasmuch as the need for ever higher levels of labour productivity is endemic to the capitalist economic system.He claims that "the problem for capitalism which towers over all others and which takes the form of a crisis threatening survival itself,remains : more productivity" (9).

In his reference to specific examples such as N.C. (Numerically Controlled) machine-tools and the Fordist assembly-line,Braverman focusses upon managements' use of technology to reduce the skill and discretion of workers within the production process.He is able to make out a convincing case for the argument that technological change embodies a general tendency to use "new methods

and new machinery to dissolve the labor process as a process conducted by the worker and reconstitute it as a process conducted by management" (10)

The force of Braverman's argument is amply demonstrated by the number of writers who have,to a greater or lesser degree,adopted his model of technological change. Edwards,Noble,Shaiken and many others (11) have taken up and developed his analysis,counterposing the skill and discretion of labour with the tightening managerial grip upon production.For example,Clegg and Dunkerley make the claim that "the most efficient technology..will be chosen only if it is compatible with securing the maximum control over worker behaviour" (12).And yet,despite this wealth of adherents in the literature,the attempt to apply Braverman's analysis to a particular case-study raises a number of seemingly intractable problems.

Technology and Power

The first element of a re-assessment of Braverman's view is expressed by Elger (13),who notes that Braverman neglects the day-to-day tenor of power relations between management and workers.While Braverman emphasizes the importance of skill and discretion in resisting management control,Elger suggests that "collective worker organization may gain increased wages and the status of skilled workers with little evidence of craft expertise" (14).Conversely,he claims,a work-group's possession of a high level of skill may be unable to guarantee any

significant degree of freedom from managerial control, for skill "may be embedded within a complex structure of collective labour effectively subordinated to capital accumulation" (15).

In essence,Elger is simply drawing attention to the fact that the bargaining power secured by union organization may be able to provide a degree of autonomy from management control which technical skill alone may not.It follows from this that instead of pursuing Braverman's concern for the qualities of capital and labour as intrinsic aspects of the production process, we ought to focus much more upon the powers that are deployed in particular management-union relationships. Even given Eilon's point that "management activity is essentially a control process" (16),the workers' ability to develop and apply a political strength that transcends the narrow confines of their technical role in production demands that the managerial search for control be treated in adaptive rather than imperative terms.Friedman, for instance,distinguishes between two different 'strategies' of control - 'Direct Control' and 'Responsible Autonomy' - and in the process clearly indicates the possibility,and indeed the necessity,of managements varying their tactics when faced with collective worker power (17).Batstone,Boraston and Frenckel,in their study of a U.K. vehicle producer (18),reinforce this argument by noting that management were continually forced to accept 'compromises',even in their control of production ;

> "Major changes in production involved possibly lengthy negotiations over effort and reward...The most likely outcome of any major negotiations on this subject would be the negotiated compromise of some 'quid pro quo'." (19)

However pervasive or immanent the tendency towards ever increasing levels of management control, it seems that in particular cases managerial policies are heavily constrained at the level of the plant or the firm by a historically and institutionally grounded system of power relations. Indeed, the adaptive nature of management strategies for dealing with the labour-force further suggests that the drive for greater control of production is only one element, if an important one, of management's overall strategy. Again Batstone and his colleagues provide relevant comment, quoting a Production Manager to the effect that : "Cost is only one factor. Another is the Industrial Relations implications (of any course of action) ...there is a balance between peace and war. It's on a razor's edge." (20)

Some of the best examples of collective resistance to management control come from the motor industry itself. This is an industry where the de-skilling of the labour-force has been an endemic feature of production for at least sixty years, with the result that the amount of discretion exercised by production workers has been reduced to almost minimal levels (21). Yet, far from the intensity of labour subordination implied by Braverman's analysis, the motor industry has shown possibly the highest

level of labour resistance and management-worker conflict of any industrial sector (22).For all the technological change and de-skilling introduced into the industry, managements have been largely prevented by the counter-vailing power of the trade unions from achieving an unfettered command of the production process.Although their work is highly fragmented and their discretion limited, car workers have frequently been able to rebuff manager-ial initiatives and 'speed up' in production.For instance, this comment on a strike at the highly mechanized Lordstown plant in the U.S.A. comes from one of the shop-floor workers :

> "In some parts of the plant cars pass a guy at 120 an hour.They got the most modern dip system in paint.They got all the technological improvements.They got unimates (robots).But one thing went wrong.They didn't have the human factor...we stopped 'em." (23)

At the Ford Halewood plant in the mid-60's,not only did the workers succeed in rejecting management's attempts at 'speed up',but,according to Beynon,they were even able to secure an'ad hoc' and limited degree of workers' control (24) : the shop stewards secured the right of 'key holding',effectively providing them with a veto on track speeds,and by 1967 they were actually carrying out work allocation in many sections of the Trim and Final Assembly area.Such elements of control, although they could not bring about the re-definition of the work process in toto ,did effectively repudiate the standards of production efficiency which management sought to impose - line-speeds,manning levels,and so on.

Beynon's study thus underlines the extent to which the job controls, custom and practice and demarcations secured by union power may at times prove a more effective obstacle to managerial authority and control than the possession of craft skills or other kinds of technical expertise. The historical and cultural context of the plant, the payment system, demand conditions, and so on, may all have a bearing on the power relations between management and unions, and through them on the conduct of the production process itself. For example, according to a recent shop stewards' publication (25), buoyant market demand in the U.K. in the 1960's meant that "managerial strategies for maintaining their authority over the workers concentrated on avoiding confrontation, on minimising supervision from above, on using shop-floor organization for allocating work" (26). This is not to say that worker skills and discretion are of no importance whatsoever, for as we will recount later the possesion and protection of skills proved to be a significant factor in relations between management and maintenance tradesmen at Longbridge. Yet, the fact remains that the job controls and custom and practice accumulated by shop-floor union organization constitute an effective barrier to managerial prerogatives and control, quite independently of the content of the individual workers' jobs.

The nature of labour subordination

At the heart of this issue lies the division that we have traced between the qualities versus the powers

of labour, and between the possession of technical skills as against the collective protection of job controls. It seems clear from the examples cited above, that this implicit distinction reveals a more complex character to labour subordination than Braverman's analysis allows. Apart from the 'real subordination' described by Braverman - subordination to management's production controls - there seems to be a second dimension of subordination which is relatively independent of the worker's role in production. In effect, the subordination of labour to capital seems to operate in two fairly distinct ways. Firstly, corresponding with Braverman's model, there is what we will term 'subordination within production' ; the degree to which the worker as a factor of production is subject to management's organizational or technical controls. Secondly, flowing from the political relations between management and workers, there is 'subordination to production' : the degree to which the collective interests of the work-force are effectively subordinated to capitalist values and criteria of efficiency.

In dealing with technological change, this distinction assumes a vital significance, for the 'subordination of labour within production' that results from mechanization or automation may be no guarantee of the work-force's 'subordination to production'. A couple of examples from the highly automated oil-refining industry serve to reinforce this point. First, a recent study by Gallie (27) relates the different production efficiencies and practices of a British and French

oil-refinery respectively not to differences in technology,but rather to the contrasting textures of management -union relations in the two countries.Ironically,Gallie echoes Beynon in speaking of a 'frontier of control' between management and workers in the two refineries. Second,an earlier study,carried out by Flanders,of the Fawley refinery in the U.K. reinforces our view that the technical control of labour cannot secure its political subservience (28).Not only does Flanders emphasize the extent to which the refinery's competitive efficiency depended on the work practices adopted by the work-force,but he also highlights the political character of the job controls and demarcations operated by the workers.Fawley management were only able to eliminate certain of these 'restrictive practices' by a long and tortuous process of negotiation - and even their eventual success only represented a brief lull in a long-term struggle.In essence,the workers' political interests were so opposed to the values implicit in management's search for efficiency that their 'subordination to production' could only be a temporary feature.As Flanders explains, the shop stewards' concern for demarcation,

> "..was because they had no confidence that conditions which made it necessary in the past might not arise at Fawley..The crux of the matter was full employment.If the refinery remained prosperous,the agreements (for labour flexibility) could be guaranteed and kept,but if conditions deteriorated - demarcation would return." (29)

The negotiation of technological change

As the examples above serve to indicate, whatever the de-skilling consequences of new technology that technology cannot of itself secure the levels of efficiency for which it has been designed. As a result, the introduction of new machines or methods often involves management in political as well as technical initiatives - seeking to ensure the workers' acceptance of planned efficiency objectives. Although such political initiatives are often veiled in the pluralist terminology of productivity bargaining, in essence they represent management's attempt to placate or conceal a basic conflict of interests. (30).

The political character of management-union negotiations on new technology is exemplified by the ideological role played by the concept of 'technology' itself. As Shaiken notes, management's appeals to technology can draw strength from "a powerful ideological consideration : that technological change is progressive and inevitable" (31). A view of technology as both neutral and ultimately beneficial is so deeply rooted in Western industrial society that it may be very difficult for trade unions to counter such managerial arguments. Further, the fact that the design of new technology is out of the unions' control makes opposition even more problematic. Officials of the French union, the CFDT, describe how "technical change seems to fall out of the sky, even when the decision to invest goes back many years." (32)

At shop-floor level the ideological importance of technology is, if anything, even greater. Machines and systems installed on the factory floor, despite the fact that they embody managerial objectives in their design, appear to take on a 'necessity' all their own. As Braverman notes, machines

> "..seem in human eyes to act for themselves and out of their own inner necessities. These necessities are called 'technical needs', 'machine characteristics', 'the requirements of efficiency', but by and large they are the exigencies of capital and not of technique." (33)

Reinforced by its material expression in the operations of mechanized or automated systems, the notion of 'technical necessity' can be manipulated by management to influence worker behaviour by what might be called ideological rather than mechanical means. Bechhofer, for instance, terms this influence the 'indirect control' (34) of behaviour, and Shaiken, in referring to the introduction of a 'factory management system', describes its operation at shop-floor level : "Had a system that time studies skilled work been introduced as 'new work rules', there might have been total uproar, but embedding it in 'technology' mystifies the social content and makes it appear inevitable." (35)

To judge from these comments, and indeed our own empirical work, the ideological status of technology can be of considerable tactical value to managements faced by union opposition to technological change. As Panzieri puts it ; "Capital's despotism appears as a

despotism of rationality, since capital welds its constant and variable parts in their most effective operation and seems to make of itself a technical necessity." (36) Given the ideological importance of 'technology', negotiations between management and workers on technological change take on a more complex character than other kinds of industrial relations issue. In one sense, the bargaining over new technology becomes a matter of what might be called 're-negotiating necessity', for the trade unions are often forced to refute or amend managerial appeals to 'technical needs' or 'the requirements of efficiency'.

The politics of efficiency

The analysis so far suggests that the process of introducing new technology involves both the technical and the political subordination of the workers. On the one hand, management seek to impose a technological framework in which labour discretion is reduced and managerial control enhanced. On the other, management are confronted with the non-technical problem of securing the workers' adherence to standards and norms of efficiency, which, even in the most automated processes, can only be partially incorporated in the design of the technology. Since, as Salaman notes, "the search for greater efficiency is inherently sectional or political" (37), technological change and the political initiatives that accompany it, rather than being separate activities are inextricably

intertwined.In the following chapter we will describe this interlinking of the technical and the political, with detailed reference to two of the most important technological changes undertaken by the motor industry.

CHAPTER THREE

TECHNOLOGICAL CHANGE IN THE MOTOR INDUSTRY

Introduction

The dynamics of technological change in the motor industry have already been briefly touched on, principally with reference to the Utterback and Abernathy 'life cycle' model. The following, very selective account of two major shifts in the industry's technological base aims to take us beyond the rather one-dimensional perspective of such models, and towards a better understanding of the social processes involved in technical change. In particular, it takes us on to the ways in which managements assimilate new technologies and methods, and then strive to secure their efficient operation. The two examples chosen for this purpose - namely the assembly line and industrial robotics - are useful inasmuch as they both represent major technical 'trends' in the industry, past and present. Moreover, when we come to examining the technologies installed at Longbridge to produce the Metro our two examples will figure prominently.

Assembly-line methods in the motor industry

Since its introduction in 1913-14 by Henry Ford, the assembly-line has become a characteristic, almost

symbolic,feature of the car industry.Even though only around 20% of the industry's total work-force are actually employed on the assembly track,the moving line constitutes the central,controlling technology for almost all the major sub-processes of car manufacture, most notably in the 'Body In White' assembly process and the 'Trim and Final Assembly' area.The flow production methods upon which car production is based mean in effect that the moving lines have become the major tributaries of the car assembly plants,into whose sequential flow all the other sub-processes are merged.In fact,the moving line is so crucial to car assembly that successive phases of mechanization have left it largely untouched.Even in the automated 'Body In White' process at Longbridge,the major shift in technology did little to so much as threaten the complete elimination of assembly-line methods,and these were retained for the labour-intensive 'finishing' area of the new plant.

At first glance,the strategic importance and the pervasive character of assembly-line techniques seem to be simply the product of the motor industry's peculiar economic and technological characteristics.Given the complexity of tasks,scale of production and number of separate parts (over 15,000) involved in the mass production of cars,the assembly-line seems to be the only practical solution to the problems of economy and organization.Not only does the line ensure the efficient utilization of both labour and capital,but it

also serves to organize and coordinate the many complex and specialized operations into a single,sequential flow.In addition,the line also has the effect of economizing on the use of factory floor-space,and,more importantly,greatly facilitates managerial planning of production (2).

It might almost be taken for granted that such impressive technical advantages would provide an adequate explanation for the widespread diffusion of assembly-line methods,both within and outside the motor industry.They might even be taken as explaining the ideological significance attained by this relatively simple innovation - for,as Emery notes,"the logic of the assembly-line is a keystone...of prevailing twentieth century concepts of human management" (3). Yet,for all its much vaunted technical benefits,in purely economic terms the rationale for the moving line is far from clear-cut.Although the original applications of the assembly-line resulted in massive increases in labour productivity - of the order of 800% (4) - the new method also brought with it many additional production costs.Despite the line's intrinsic economy,the organization of the work process around it involved many in-built sources of cost which were unknown or relatively non-existent in other forms of production. Emery provides an analysis of some of these extra costs ; transfer costs (the time and effort needed to transport components to the track) ; standardization

costs ; line-balancing costs (involving waiting time) ; external coordination and pacing (the need for close supervision of the de-skilled workers).(5).Further,the fragmentation of tasks that accompanies assembly-line production necessitates a much greater provision for additional,re-integrative functions such as quality control,production control,'rectification' (repair of poorly executed work),and so on.Indeed,so great are the problems of controlling and coordinating such highly specialized tasks,that even as late as the 1960's,according to Kildridge and Wester (6),the major U.S. producers had still not solved the problems of line-balancing and uneven work allocation : they found that on average 25% of the working time of the assembly-line worker was unproductive or wasted.

However,while the purely economic advantages of the line seem uncertain,the one area where the line is unequivocal in its effects is in its organization and control of the manual labour-force.The adoption of the moving track brings with it the close,unceasing pacing of the work-force.When combined with Taylorist work measurement techniques,the line ensures that the work behaviour of each worker is tightly controlled.As Edwards comments,the introduction of the line "resolved technologically the essential first control task ; it provided unambiguous direction as to what operation each worker was to perform and it established the pace at which the worker was forced to work" (7).

While Taylor had subjected the workers to stringent organizational controls and discipline, involving, as Maier notes, the "application of the supposedly machine-oriented discipline of engineering to labor relations" (8), Ford's success lay in going one stage further. The introduction of the assembly-line installed the moving conveyor itself as the primary method of managerial control of the labour-force. The result, as Edwardes describes it, was that ;

> "Struggle between workers and bosses over the transformation of labor power into labor was no longer a simple and direct personal confrontation ; now the conflict was mediated by the production technology itself." (9)

These aspects of management control which were embodied in the mechanical design of the track, also found expression in the political and ideological considerations which played an important part in the assembly-line's diffusion. As described by Maier, the introduction of the assembly-line to Europe was closely linked to the promotion of Taylorist and Fordist ideas - and not just as production techniques, but as semi-political manifestos. Ford actively sought to promote his methods as a political solution to economic problems, and his ruthless efforts to suppress trade unionism in Ford factories only gave more overt expression to the political ideals which he sought. The truth was that the political connotations of Fordist methods were evident from the very inception of the new assembly-line methods -

the installation of assembly-lines in Ford's Detroit works coincided with an attempt by the city's 'Manufacturers Association' to suppress trade unionism in the city (10).Given the kind of anti-labour policy associated with Fordist methods,it is hardly surprising that Ford's political ideals were especially attractive to both technocratic and Fascist ideologues in Europe (11).

Despite the comparative simplicity of the assembly line in technical terms (12),the advantages to be gained from its adoption do not seem to have been viewed as in any way compelling or overwhelming by the European manufacturers of this period.In Europe,the prevailing economic and political structure meant that the acceptance of assembly-line methods depended on their being located within a larger social and political manifesto.As Maier explains ; "Whereas in America the commitment to technological efficiency and productivity pervaded the entire culture,in Europe it appeared more selctively" (13).The result was that the notions of 'efficiency' built into the assembly-line itself could not be accepted as a purely technical rationale in Europe,but required important political and ideological trimmings.Given that the assembly-line involved,as we noted earlier,significant additional costs in terms of work timing,line balancing and so on,the adoption of the line seems to have depended upon the ability of individual firms to assimilate and comprehend the whole rationale of efficiency propounded by Fordist techniques.

The problems of securing or even defining the appropriate social and technical relations on the shop-floor seem to have retarded the diffusion of the line, such that in the inter-war period the major European producers installed the new methods in what was a fairly gradual and piecemeal way. Admittedly, both Citroen and Renault had begun to make use of moving assembly tracks by 1922, but in most other European firms the pace of adoption was much slower. The British industry, in particular, does not seem to have found Ford's "practical solution to the labour question" (14) to be especially attractive. It seems that the attitude of what Maier describes as "an industrial leadership set in its ways" (15) had a generally dampening effect upon the introduction of the new technology. Although Austin had begun to install the new techniques by 1925, Morris retained stationary assembly methods for even longer, only introducing a moving track at Cowley as late as 1934 (16).

Whatever the reasons behind the relatively slow diffusion of the line, the policies of the European trade unions cannot be counted as a major factor. Despite the harmful social consequences of this technology, the stance taken by almost all the European trade unions was, according to Fridenson (17), one of passive resistance. There was no significant opposition from British union officialdom, for instance, which simply "continued its policy of output exhortation" (18). In France, the CGTU argued,

as Fridenson notes, that "the line was a finding of science. You cannot fight against science or machinery more than you can fight against the rain...the union's policy could only be to struggle over the consequences of mass production." (19)

Overall, the reactions of the trade unions to the assembly-line suggest that its ideological status as a 'finding of science' may well have been an important factor in undermining the resistance of organized labour. Certainly, the ideological aspects of the line served to reinforce the role played by the other non-technical factors in its diffusion. Firstly, the degree of managerial control of production that it afforded seems to have been at least as significant as the line's technical and economic advantages. Secondly, even amongst management themselves the adoption of assembly-line methods seems to have been closely bound up with the prevailing state of social or cultural relations. In this regard, a crucial element seems to have been the European capitalists' ability to accept and assimilate a peculiarly American version of productive efficiency.

In the latter sense, moreover, the adoption of the line seems to have rested upon an aspect of managerial behaviour which has continued to be important up to the present day. For instance, Masterson and Haywood in a recent article on 'innovation' note that the 'potential adopter' "looks for relevant cues on which to base his assimilation of the innovation. His success depends upon his selection of the relevant cues..his conceptual system." (20)

The application of industrial robotics

As we have already noted, the application of industrial robots to car production generally involves only a very selective replacement of the assembly-line itself. The robotic systems are in almost all cases integrated into the sequential flow of production, and often reflect this position in some form of serial or linear layout (fig.1) that incorporates a moving or 'indexed' conveyor. However, the simple fact that industrial robots have had little or no effect upon the flow production character of car manufacture should not be taken as implying that their role in the industry does not have great significance. Over the last ten years, the use of robots by car firms has been growing at a steady rate, such that this technology now represents the most important production trend in the industry, and one offering the greatest likelihood of radical change in the future.

From the first major application of robots in 1970 at General Motors Lordstown plant in the U.S.A., both the number and scope of robotic production lines increased considerably during the 1970's. By 1978 over 400 robots were employed in the European motor-industry, and by the following year the major U.S. producers had installed a total of 476 of the machines (General Motors 160, Ford 236, Chrysler 60) (21). Initially, as with the assembly-line, the pattern of diffusion was a matter of gradual accumulation rather than breakneck speed, with certain


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firms,notably Fiat,Renault and Volkswagen,taking a clear lead in the pace and scope of adoption (by 1980 all three firms had installed between 200 and 350 robots each) (22).

Since the advantages offered by robots were applicable to many different aspects of car production,the motivating factors behind their diffusion were manifold. Moreover,as robotic technology developed during the 1970's it began to display an increasing technical superiority over other forms of mechanization.In the area of Body In White spot-welding,for example, robots were increasingly employed to replace the relatively obsolete specialized and 'dedicated' multi-welder and press-welder technology.In contrast to these highly complex and elaborate machines,industrial robots,given their electronic controls and memory, were re-programmable and thus could be fairly easily switched from one production task to another.As a result,unlike multi-welders or press-welders,the new robotic systems did not have to be totally scrapped with each change in body style.This element of technical flexibility meant that industrial robots brought vital economies in the area of capital investment,since production facilities that were not dedicated to a particular model had a much greater operational life span.

Apart from the purely technical gains in flexibility that accompanied the adoption of robots,other and perhaps more important motives for their introduction

came in the areas of labour productivity and product quality.Even in the simplistic terms of a straightforward cost comparison,robots had become an increasingly attractive replacement for human labour by the end of the 1970's : in 1980 one estimate put the hourly cost of a £20,000 robot (including maintenance and depreciation) at around £2 over a two shift day,and this was compared with the £6.50 hourly wage cost of a U.S. auto worker (23). When this is added to the fact that a single robot might replace as many as five to seven workers over multiple shifts,the economic attractions become undeniable (24).

During the 1960's writers such as Simon (25) had contended that human workers held a key advantage over machines in the area of 'flexibility'.However,during the following decade,the ever increasing levels of robot re-programmability and flexibility (in the sense of performing different operations and using different tools) rapidly began to invalidate such claims.In fact, the flexible and anthropomorphic qualities of robots meant that they were actually very effective in supplanting human workers from the many simple,routine tasks involved in car manufacture - notably spot-welding and painting tasks.In the Fiat 'Robogate' plant at Rivalta the introduction of robots entailed a reduction in manning levels from 125 to 25 workers per shift (26).Another example comes from Volvo where a single robot line replaced 75 workers (27).Indeed this degree of labour substitution was a fairly widespread feature of the industry

by the end of the decade, such that the Longbridge case detailed in later chapters assumes an almost commonplace character. In many plants in the European industry it was not unusual for up to 80 or 90% of the 'Body In White' spot-welding operations to be performed by machines - generally by a combination of robots and multi-welders (28)

In addition to the productivity gains offered by robots, the other major benefit that they provided came in the high levels of product quality that resulted from their mechanical predictability and reliability. A production engineer from Ford Werke in West Germany described the quality aspects in the following way ;

> "Our robots' rejection rate is practically zero. When robots do the job we know that all the welds are made in the correct position. Welds can be missed when they are done manually. This was a major factor in our decision to install robots." (29)

However, although there was undoubtedly a real motivation to use robots to improve quality - which was intensified for processes critical to product safety - there is no disguising the fact that both the quality and productivity advantages of robots entailed a major downgrading of the role of human labour. In those areas where robots were employed there was a consequent intensification of what we defined earlier as labour's 'subordination within production'. In short, management's control of production was greatly enhanced by the application of robots. For example, in outlining Ford's decision to install

39 robots in the 'Body In White' area, the Manufacturing Manager of Ford Halewood explained ;

> "We haven't got control of the labour-force. We can't force each man to put each weld in the right place. So we've tried to build in quality through machines." (31)

But the utility of robots was not simply that they brought about what Owen calls a "reduction in the number of random factors that influence the quality and efficiency of the process" (32). Robots were also employed in a more political way by management. For instance, robots were often applied to 'dirty jobs' - welding, paint spraying, and so on - and while the managerial justifications were mainly in terms of improving working conditions or quality, equally frequently the elimination of militant or troublesome groups of workers seems to have been an important consideration. At Halewood, Ford management admitted that the processes they had chosen to robotize had previously been "a source of labour unrest" (33). Moreover, as the scope of industrial robots was gradually extended - from welding and apraying to complex assembly tasks using T.V. vision - their increasing technical prowess only seemed to reinforce Shaiken's view that "the direction of development...is towards robots that automate those jobs where the operator has some control over the pace of his work" (34).

It was estimated that the motor industry's use of robots would grow by 35% per annum during the 1980's (35), and Figure Two, which illustrates Volkswagen's actual and

planned adoption of robots up to 1983, seems to corrobor-ate this claim. Such was the potential impact of robotic technology, indeed, that the automation of many of the most labour-intensive areas of car production became a very real possibility. For example, Shaiken's claim that :

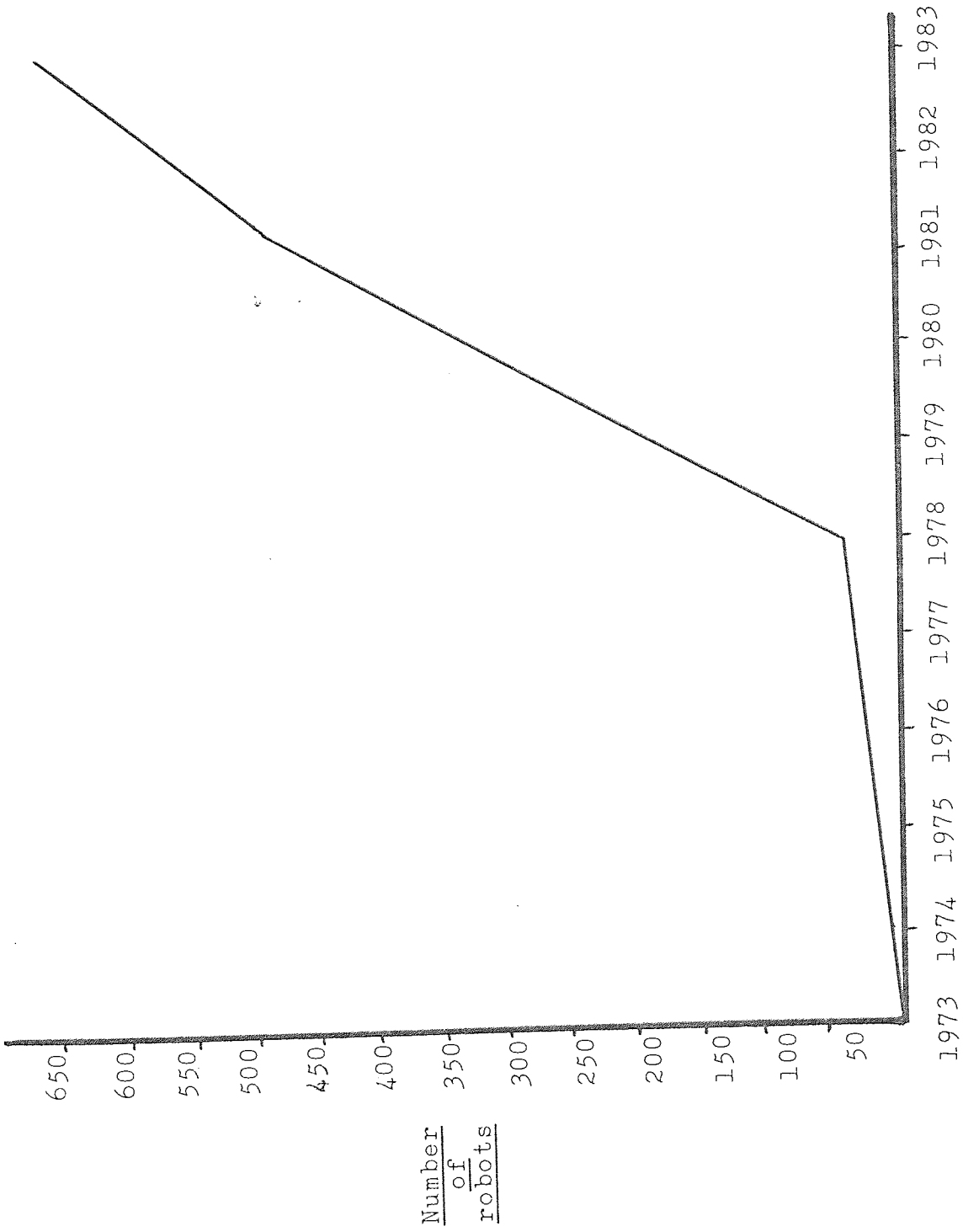
> "GM is considering using robots in every aspect of S car assembly (36) according to internal documents. The entire car will be made up of modular components so that robots can ultimately be used in the highly labour-intensive operations that are most difficult to automate. GM is evaluating the use of mechanical arms to install windsh-ields and backlights in the trim area, and transmissions in the chassis. Other functions such as painting and welding will be completely automated." (37)

General Motors expected to be employing around 14,000 robots in its factories by 1990 (38) - an order of technological change which had clear and unequivoal implications for the human labour-force. As the editor of the U.S. journal 'Automotive Industries' noted ; "There has been some labor-saving automation brought into the auto business in the past quarter century.. But it really has been minimal compared to the potential that robots offer for eliminating human labor." (39)

The trade union response to industrial robots

With all the evidence indicating another major down-grading in both the skills and numbers of car workers, perhaps on a par with the effects of the assembly-line, the response offered by the leaders of organized labour was clearly critical. Although robots offered to secure

FIGURE TWO



VOLKSWAGEN : ACTUAL AND PLANNED ADOPTION OF ROBOTS,1973-1983

Source : 'Der Gerwerkschafter',Dec. 1980

a comprehensive diminution in the technical role played by human workers,they could not of themselves achieve what we described earlier as labour's 'subordination to production'.This task involved managements in various forms of negotiations with their trade unions - aimed at forestalling or preventing labour resistance to their plans.(40)

As the changes in technology were to be greatest and most profound in the U.S. auto industry,it is not surprising that management-union negotiations there seem to show the greatest concern over new technology issues.In particular,the bargaining between Ford and the United Auto Workers union presented the conflicts in probably their most acute form.In 1979 Ford UAW, anticipating the future impact of the new electronic technologies,put forward a set of claims - 'Guidelines for the Introduction and Use of New Technology'.The claims were comparatively radical in character,demanding, for example,reductions in work time,natural wastage rather than redundancies,and perhaps most important of all ; "Work and skills currently part of the bargaining unit must remain in the bargaining unit...employees must receive adequate training to perform the jobs introduced by new technology." (41).

But,while the union sought in a fairly direct way to pre-empt the harmful consequences of technological change,and even secure some control over its introduction, even so its stance included a deferential gesture towards the ideological status of technology that was

reminiscent of union policies towards the assembly-line in the 1920's and 30's :

> "The Union recognizes the principle that a continuing improvement in the standard of living of employees depends upon technological progress,better tools, methods,processes and equipment,and a cooperative attitude on the part of all parties in such progress." (42)

The union's acceptance of the inevitability and even the desirability of 'technological progress',helps to explain the higher priority that it allocated to regulating the effects of new technology than to controlling its introduction.Admittedly,the unions claim did include a clause to the effect that ; "On machines and systems that affect the job content of its members,the Union in discussion and negotiation must be involved on the level of design and implementation." (43).Yet,in the eventual agreement of its claim,Ford UAW was prepared to accept the loss or dilution of its attempts to exercise some control over the new technology,including its clause on the retention of work within the bargaining unit.The demand for consultation and involvement in the design and implementation of new technology was reduced to a skeletal form which left the managerial prerogative virtually intact : "Comments by the Unit Committee (shop stewards) concerning the information provided will be carefully evaluated by the local management in accordance with the Company's policy relative to the assignment of work." (44)

Such concessions to managerial authority,although contrasting stangely with the original claim,do seem to

reflect long-standing elements of union policy.Even during the difficult period of the 1970's,productivity in the U.S. auto industry rose at more than double the rate of the rest of manufacturing industry in the U.S.A. (45).In effect,despite pretensions towards achieving some degree of control over technological change,the fundamental position of the union seems to be well expressed in Business Week's comment from 1979 :"The UAW has historically recognized the inevitability of technological change.Rather than negotiate restrictive work rules,it has bargained for more of the productivity pie." (46)

Notwithstanding such important qualifications, however,the kinds of demand made by Ford UAW and even the actual agreement reached with Ford management seem to represent somewhat of a high-water mark in the efforts of trade unions worldwide to secure a degree of control over the introduction of new technologies such as industrial robots.Apart from a few notable exceptions such as the FLM at Fiat (47),there has been relatively little challenge from organized labour to the managerial control of the rate and direction of technological change.In much the same way that the assembly-line met little or no effective resistance from union leaderships, the ability of the major firms to exploit the potential of new technologies has been almost entirely undisputed.

The strategic role of industrial robots

The lack of union opposition to the spread of industrial robots,together with this technology's intrinsic potential for de-skilling labour and increasing the managerial control of production,might be taken as supporting a Bravermanite view of robotic technology. Yet,even given that robots do offer a greater degree of management control,to simply view them as tools for increasing the 'real' subordination of labour or even for securing higher levels of producivity is to neglect one of their most important aspects.Most of the available evidence suggests that the adoption of robots by the major firms is actually a function of decisions taken on a strategic plane,rather than deriving from the point of production antagonism of capital and labour.In the case of General Motors,for instance,the extensive application of robotics is only a part of an overall strategy of modernization - whose scope is such that,by 1985,25 of GM's 29 North American plants will be either brand new or extensively re-modelled (48).In Europe too,the reasons why firms such as Renault,Volkswagen and Fiat have begun building and developing their own robots seem to be mainly strategic in character (49).Overall,these large-scale programmes of technical change seem to be best viewed in the light of the strategic choices made by the major manufacturers - and not simply as general tendencies immanent in capitalist technology.

In both the European and U.S. industries,the increasing market stagnation and over-capacity that has been almost endemic since the 1973-74 oil crisis has encouraged a massive re-structuring of production in which the industrial robot is playing a progressively greater role.By the end of the 1970's,the robot was being seen as the perfect technological complement to the new,emerging competitive order in the world industry - an order which found ideal-typical expression in the so-called 'World Car' strategies of many of the largest corporations (see the following chapter).Just as the assembly-line had been associated with the opening up of a mass-market for cars (50),the robots' ability to re-organize production in line with the new strategies of internationalization seemed to give them a significance above and beyond their technical capabilities.As the Economist put it ; "Robots..re-write the mass-production rules for making motor cars" (51).

At operational level,the robots' technical flexibility and the fact that they were not dedicated to any single model meant that,under conditions of market uncertainty,they offered important long-term advantages over other forms of automation.At the 'Robogate' plants in Rivalta and Cassino,Fiat exploited this advantage to the full by executing the entire BIW 'body-framing' process (52) with industrial robots (see Fig. Three).As a result the 'dedication' of the investment was limited to just 10% of the total outlay,and,of equal importance,the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plants' operational flexibility was maximized ; Fiat claimed that two separate versions of two completely different models could be produced at the same time from each 'Robogate' facility.In addition,production volumes of each model type could be adjusted to meet fluctuations in the market - the 5 door 'Strada',say, could increase from 40% to 100% of total output - and it was even possible,at minimal extra cost,to add further production capacity to the system (53).

But the utility and flexibility of industrial robots at operational level made up only a relatively small part of the overall significance of robotics.This new technology offered a much greater contribution to corporate objectives insofar as it facilitated a wholesale re-organization of the production throughout the company.For example,when Ford established production facilities for the new Escort at their Halewood and Saarlouis plants,it was clear that their use of robots was designed to further a major element of corporate policy.In order to gain maximum benefit from the 'multi-sourcing' of production and economies of scale, Ford were trying to transform the ground-rules upon which car manufacture had previously been based.Rather than tying a model's production to a particular plant, Ford were able to loosen some of the technical constr-aints - the 'product-process linkage' - which had previously meant that capital investment was committed to a particular location.They sought to make production more easily transferrable between plants and more mobile.

Robots supported this objective in two important ways.Firstly,they greatly simplified the whole process of body-shell (BIW) assembly.Previously,the manual welding of sub-assemblies on 18 'carousel' jigs had produced a massive variation in the possible combinations of body panels - resulting in a total of 1280 body types.By applying robots,however,management reduced the number of possible combinations from 1280 to just 16.Secondly,and more importantly,the re-programmability of robots allowed the easier interchange of production methods between plants.As Halewood's Manufacturing Manager explained ;

> "The one big advantage of having this equipment at Halewood and at our sister plant in Saarlouis,is that any development in process or a reduction in cycle times can be instantly transferred from one plant to another simply by programming a chip in one plant,taking it to the other and introducing it into the UTDs (i.e. robots) employed there." (54)

In this way,the use of robots secured a strategic as well as an operational flexibility for Ford.The seemingly contradictory drives towards ever lower production costs and yet greater market responsiveness could thus be reconciled by minimizing the firm's dependence upon a particular plant or work-force (55). Under prevailing market conditions,the significance of robot technology can be gauged from an official announcement made by Ford in 1980,to the effect that management planned to install between 350 and 500 robots in the firm's European plants by 1983.So great was the

strategic importance of this programme that even profitability was given a secondary priority,with the required payback on automation projects being cut by one third (56).

For Ford Europe the stimulus to carry out this re-structuring of production methods had been in large part the result of management's apprehension over the alarmingly high levels of productivity and quality achieved by the Japanese.In fact,a so-called 'After Japan' programme of work practice changes was instituted within the firm.But,apprehension of the Japanese was not confined to Ford alone,and in 1979 and 1980 the major American producers were goaded into devising plans for radical changes in production by a combination of increased Japanese import penetration, and certain revelations about the productivity levels secured by the Japanese industry.For example,it was disclosed in 1980 that there was a gap of around 100% between the productivity levels of General Motors and Toyota respectively.(57).In addition,a government report estimated that the Japanese producers enjoyed a unit cost advantage of around $1,000 - $1,500 on each car imported into the U.S.A.(58).This kind of disclosure,coupled with the effects of domestic market recession,led the major U.S. producers into carrying out a fundamental re-thinking of their corporate strategies towards the end of the 1970's.The projects for robotization discussed above were clearly an important part of this revision of strategy.They accompanied equally significant moves towards the achievement

of what a government report called a "new socio-economic compact between industry, labor and government" (59). In 1981 this 'compact' was still the subject of 'back-room sessions' (60) between management and UAW leaders.

To sum up then, it appears from the above analysis that the corporate strategies developed by certain of the major car firms in the late 1970's were chiefly remarkable for the way in which they exploited the technical potential of industrial robotics. For many of the largest producers - firms such as General Motors, Ford, Renault and Volkswagen - the robot took on the character of an instrument of corporate policy.

It would be a mistake, however, to assume that the widespread diffusion of robots indicated a great degree of strategic uniformity amongst the major firms. Indeed, a number of producers - notably Renault (61) - chose to explore alternative routes to the internationalization of production. Moreover, certain of the smaller firms - in particular British Leyland as described in the following chapter - had in any case only very limited opportunities to pursue such a strategy. Overall, however, the late 1970's saw a number of the largest corporations moving towards a fully international production strategy.

The uneven and gradual way in which the major producers assimilated and adopted 'World Car' policies, and hence their application of robots, provides further

evidence for the view that technological change is a matter of 'strategic choice' and not a deterministic response to market stimuli.Although it seems clear that a new competitive order was emerging in the industry over this period - something which will be discussed in more detail in the next chapter - the actions of the car manufacturers seem to be less a direct effect of the new market situation than the result of their uneven and irregular assimilation of the new notions of strategic efficiency.In particular,while robots offered a great many purely technical benefits in production,it seems likely that their actual and potential diffusion depended in large part upon this process of assimilating and formulating certain novel criteria of productive efficiency.

Conclusion

This brief survey of two major changes in the motor indsutry's process technology has yielded a number of important points.Firstly,we noted of both our examples that their technical characteristics alone could not fully explain their pattern of diffusion within the industry.One of the most important non-technical aspects of both these technologies seems to have been their contribution to the managerial control of production and of the labour-force.As Edwards notes of the managerial choice of technology in general ; "there are several considerations that enter into the calculation of profitability.One is technical efficiency,the ratio of

the physical outputs to the physical inputs ; another is the cost of the various inputs and the value of the outputs ; yet a third is the extent to which any technology provides managers with leverage in transforming purchased labor power into labor actually done" (62). It also seems that managements were able to secure the potential degree of control offered by these technologies largely unfettered by the bargaining power of the trade unions.The relative passivity of organized labour in the face of both the assembly-line and industrial robotics seems,from our admittedly slight discussion, to be partly the result of the ideological status awarded to technological 'progress'.

However,while the point of production incentives to technological change certainly did play an important part in the diffusion of both the assembly-line and industrial robotics,beyond plant-level advantages of a technical or economic sort lay another and perhaps more important frame of reference for technological change.In the case of industrial robots,the strategic choices taken by the major firms,in response to a new, evolving competitive structure,seemed to take on a critical significance,emphasizing the role of the strategic rather than operational versions of 'effic--iency' pursued by manufacturers.

In the following chapter,this important notion of strategic choice will be examined in greater detail by specific reference to the case of British Leyland.

SECTION TWO

BL : STRATEGY AND INDUSTRIAL RELATIONS

CHAPTER FOUR

BRITISH LEYLAND AND THE MARKET

Introduction

In the broadest sense,the control of technological change seems to be a matter of the choices made and decisions taken on the strategic plane of managerial decision-making.Consequently,in switching our attention from the general dynamics of change within the industry to the specifics of the Longbridge case-study,it seems appropriate to begin with the overriding strategic determinants of the changes in process technology.Not only did British Leyland's corporate strategy furnish the starting-point for the programme of capital investment at Longbridge,but at a detailed level there were many interrelations between the broad prescriptions of strategy and the actual design of the new technological systems at the plant.The most important of such links were embodied in the new 'Metro' model itself,for inasmuch as the new production facilities were built around the car they tended to reflect the wider market strategy of which the Metro was an important part.

In examining British Leyland's market strategy, however,it is not sufficient to simply concentrate upon

the major items of marketing policy - product range, model styling,and so on - undertaken by the firm.Although market strategy can be taken as the predominant element in the firm's planning processes,it would be wrong to view it as,in any sense,the application of an autonomous 'strategic choice' on the part of management. As any survey of British Leyland's market strategy would indicate,it is inextricably linked to the firm's historical development,and in particular its evolving organizational structure (1).So important were these factors in influencing the shape of corporate planning,the analysis of BL's strategy must begin with a description of its historical and structural antecedents.

The growth of BL

The British Leyland Motor Corporation (BLMC) as it was formed in 1968 was the final result of a long-term process of increasing concentration in the British motor-industry.The evolution of the corporation could be traced back as far as 1906,to the original car-making venture of Herbert Austin at Longbridge near Birmingham (2). Subsequently,Austin had developed into one of the largest U.K. producers and together with other well-organized firms,notably Morris based at Cowley,had come to establish a degree of dominance over the increasingly oligopolistic industry.By 1938,as a result of the competitive attrition of the inter-war period,the U.K. industry

was largely under the control of the so-called 'Big Six' (Austin,Morris,Vauxhall,Rootes and Standard) who were producing 90% of all cars manufactured in Britain.(3).

After the Second World War,the position of the domestic producers came under increasing threat from Ford U.K. (at that time 50% U.S. owned) which had the advantage of operating from a rationalized and highly integrated manufacturing base in Dagenham.This competitive threat served to give an added impetus to the existing tendencies towards integration and concentration,and in 1952 the British Motor Corporation (BMC) was formed by the amalgamation of Austin and Morris.As,Hutchins notes, the merging of the two largest domestic producers was "encouraged by the expectation of significant scale economies and a defensive response to the threat of American domination of the market" (4) Yet,despite the original hopes of greater efficiency,the growth in the British market in the 1950's - from 500,000 cars per annum in 1950 to 1.3 million in 1960 - far from stimulating BMC to rationalize and pursue economies of scale,only encouraged the consolidation of the status quo.Austin and Morris continued to operate almost as before,manufacturing cars under their own marque, and even,until 1966,retaining their own separate boards of directors (5).

As the smaller U.K. firms fell victim to the increasingly burdensome costs of product development, BMC continued to expand,but by piecemeal acquisition rather than internal growth.Thus,while BMC grew in size,

this did little to enhance the achievement of technical or even commercial economies of scale.For example,BMC's absorption of Pressed Steel in 1965 probably reduced that firm's ability to secure economies of scale,since up to that point it had been supplying body-shells to at least four different car manufacturers (6).Nevertheless the process of concentration continued,with the coupling of Jaguar and BMC in 1966 creating the short-lived British Motor Holdings.Finally,in 1968 after consistently poor trading results had weakened its ability to resist,BMH was taken over by Leyland Motors (itself a hybrid firm comprising Standard-Triumph and Rover).

As in the formation of BMC,the motives behind the 1968 take-over were largely defensive in character.Once again,this time encouraged by government prompting, there were expectations of significant scale economies, and it was hoped that the advantage of size would serve as a useful response to the increasing productive superiority of Ford U.K..By 1968 the threat posed by Ford had,in fact,increased rather than diminished and only the previous year it had increased its market share to 28%.

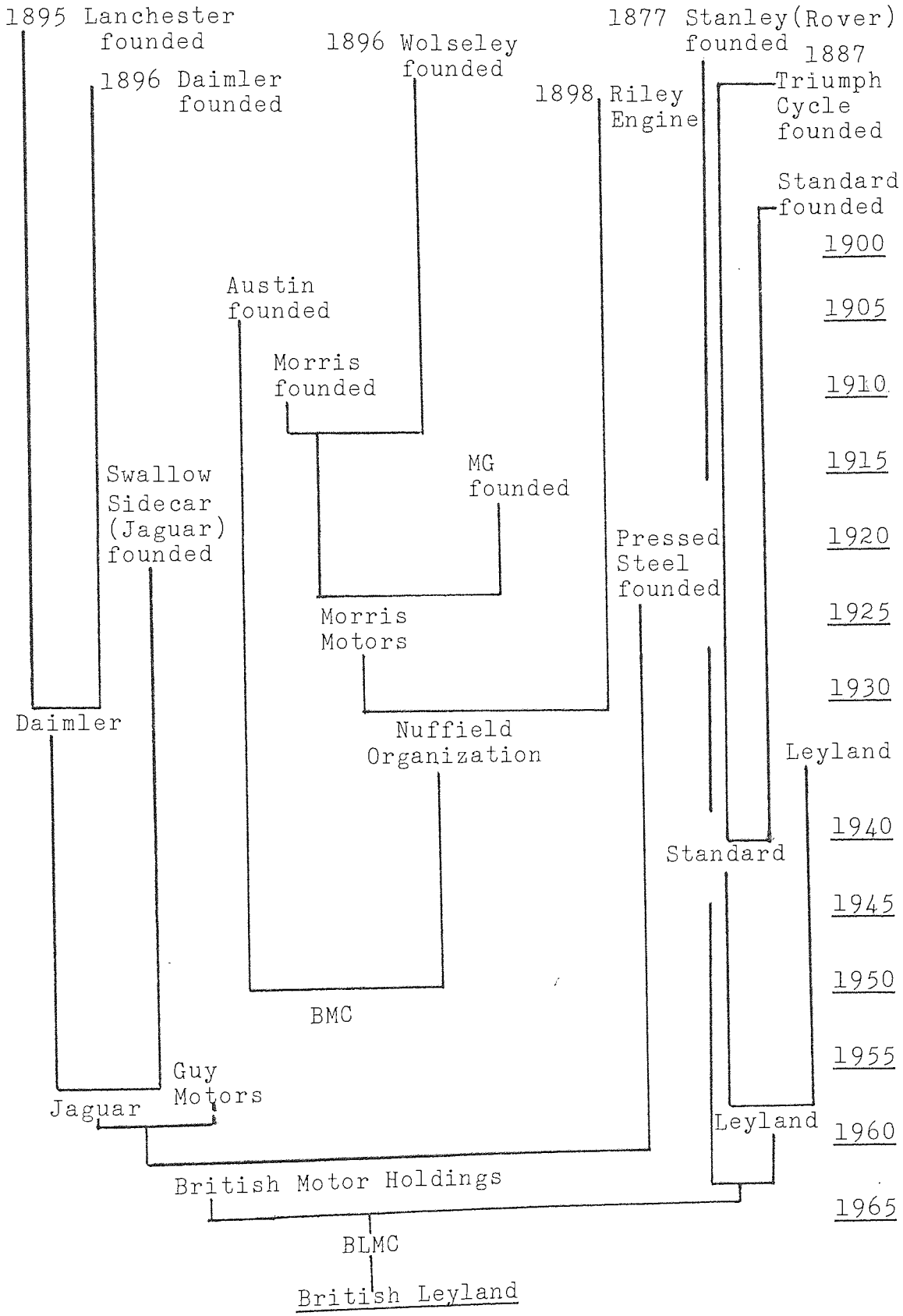
On its creation in 1968 BLMC was the largest U.K. producer with a market-share of over 40%,it was also the second largest car firm outside the U.S.A..However, for all the seeming security of its position,the new corporation was already weakened by certain fundamental

internal deficiencies - so fundamental,in fact,that they were to recur in various damaging ways throughout the following thirteen years.In the two years prior to the take-over the combined share of BMH and Leyland had fallen by nearly 5%,and in the succeeding period to 1975 BLMC continued to lose ground,with its share falling by a further 10% to just over 30%.

The intrinsic weaknesses of the corporation were manifold and many of them can be traced back to the early 1960's and even the 1950's.Perhaps the principal flaw in BLMC's structure,however,was the crucial lack of organizational cohesion that resulted from the firm's piecemeal growth and accumulation (see fig. One).The lack of cohesion and integration not only militated against the achievement of economies of scale and overall efficiency,it also contributed to and exacerbated other deficiencies by hindering effective management.Added to the firm's organizational problems,were the damaging effects of a long record of inadequate investment in new plant and facilities.The poor profitability of BMC had restrained investment in the 1960's,and this pattern of low spending was continued by BLMC which,excluding its final year of existence,never spent more than £40 million per annum on new plant and equipment - on a turnover of over £1,000 million per annum.In part,these inadequate levels of depreciation could be attributed to the harmful effects of government policy during the 1960's. Dunnett,for one,claims that the government's use of

FIGURE ONE

THE EVOLUTION OF BRITISH LEYLAND



the motor-industry as an economic regulator in this period, contributed significantly to its subsequent decline (7).

However, while some of the blame for under-investment can be placed on government, the critical failings in the model policies of both BMC and BLMC must be laid at the door of management. In BMC, largely as a result of the corporation's incoherent organization, the model range was both over-extended and poorly integrated. Perplexingly, the firm suffered from a tendency to continue production of certain models long after it had become uneconomic. For example, in 1962 five of BMC's models - the Morris Minor, Magnette, Wolseley 1500 and the Riley - could total only 15,000 in annual output, and yet the Riley and Wolseley were retained in production until 1965, and the Magnette until 1968 (8). Even the highly popular Mini, which was produced from 1959 onward, failed to make any spectacular contribution to either BMC's or BLMC's cash flows. In fact, one estimate even suggested that the Mini was actually a loss-making model from 1959 to 1977 (9). Moreover, although the Mini was consistently BMC/BLMC's best-selling model , its levels of production still fell short of the length of production runs achieved by the firm's European rivals ; in 1974 the Mini sold less than 200,000 units, yet three models from Renault, four from Fiat, and three from Volkswagen all managed to surpass that figure.

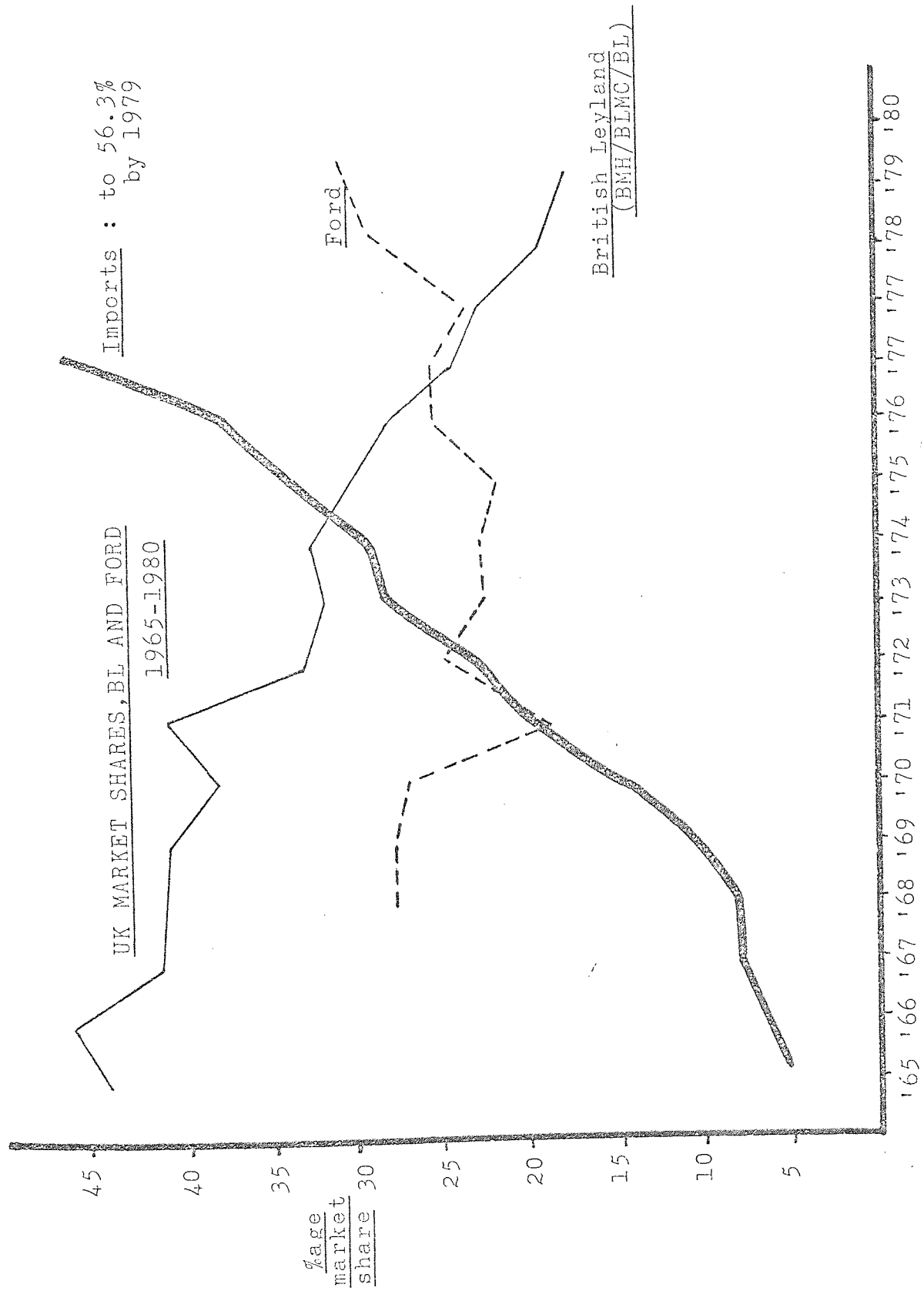
After the Mini's introduction in 1959, subsequent

new models were almost unfailingly disappointing in marketing terms,if advanced technically.During the 1960's the proliferation of poorly selling models seems to have been a further limitation on the firm's productive efficiency.In 1965,for instance,BMC's Longbridge plant was producing a total of seven different models (Mini, 1100,A40,16/22 Austin Cambridge,Austin 1800,A35 and the Wolseley Westminster)(11).The most important effect of the firm's unsuccessful model policy was to provide the ideal opportunity for the long-feared assault by a now wholly American-owned Ford organization on the U.K. market.This assault was principally felt in the mid-range family and fleet car sector where none of BMC/BLMC's models - either aging or ungainly - were a match for the Ford Cortina.

BMC's share in the light and medium car sector fell catastrophically from 18% of the total market in 1958 to just 4.7% in 1967 (12).Even the Marina which was launched in 1971 to recover some of this ground from the Cortina,had only a relatively mediocre impact. In effect,BMC/BLMC's model range weaknesses,especially in the mid-range sector,not only allowed Ford U.K. to lay the foundations for eventual domination of the market,but also set the stage for British Leyland's decline,with a falling trend in market share that is discernible from 1966 onwards (see Figure Two).

FIGURE TWO

Source : Society of Motor Manufacturers and Traders (S.M.M.T.)



During the early 1970's,BLMC's position was further undermined as its increasingly hard-pressed market-share came under growing attack from foreign imports.The McKenna duty on car imports which had been set at 33% in 1915,came down to 11% by 1972,and with Britain's entry into the E.E.C. was reduced even further so that it stood at only 4.4% on E.E.C. imports in 1975.With this kind of encouragement,the importers' share of the market increased dramatically - from just 5% in 1965 to 35% by 1975.Yet,in itself,Britain's lowering of tariff barriers need not have proved especially damaging to BLMC.In fact,insofar as Continental markets were growing faster and more consistently than the firm's home market - at a steady seven or eight per cent each year in the 1960's - E.E.C. membership might actually have acted as a boon to BLMC's ailing condition.Certainly,BLMC management had come to recognize that the firm's future growth depended on the ability to penetrate the Continental market.In 1973 management announced plans for a capital investment programme of £500 million with the major aim of increasing exports to a level of around 550,000 cars per annum, 80% of which were to be supplied from assembly plants at Seneffe and Malines in Belgium.In addition,the move towards multi-national status was to be accentuated by the acquisition of manufacturing operations in Spain, Italy,South Africa and Australia.

However,just at the point when BLMC were about to abandon their heavy reliance upon an increasingly

precarious domestic market, the firm's long-standing weaknesses in investment and product policy were prematurely brought to a head by the 1973-74 oil crisis. In combination with other adverse factors, such as the Heath government's three day week and high levels of U.K. inflation, the oil crisis had the effect of decimating the new car market, effectively scuttling BLMC's prospects of financing an expansionist programme of recovery. The firm's trading debt rose from £262 million in 1972 to £479 million in September 1974. With the company just £4 million short of its agreed overdraft limit with the banks, the government felt obliged to intervene. Financial support was provided in order to protect what was felt to be a vital national interest from at best massive contraction or at worst total collapse. Then in December 1974 the government established a committee of inquiry under Sir Don Ryder to determine the future strategy of the firm (14).

Although BLMC's financial crisis was clearly triggered by a set of extremely unfavourable circumstances; these should not be taken as constituting the only causes of the corporation's failure. As Redwood notes ; "The business which finally collapsed in 1974 had been collapsing over the previous decade and a half." (15) Grave defects in both product and production policies resulted in a run of profits that were totally inadeqate to the needs of a major car manufacturer. The simple truth was that BLMC throughout the period of the

late 1960's and early 1970's was incapable of financing itself or providing the necessary funds even for replacement investment (16).

New strategies for British Leyland

Following the government's acquisition of 95% of BLMC's equity,its direction of the new 'British Leyland' (later BL) was largely based upon the analysis and prescriptions contained in the report presented by Sir Don Ryder and his team (17).

In essence,the Ryder Plan for British Leyland proposed that the firm could achieve commercial viability,on condition that certain deeply rooted problems were dealt with.The Ryder Report focussed mainly upon under-investment as the main reason for the firm's production problems,noting that more than half the plant and equipment operated by BL was over fifteen years old.Added to this the Report was particularly concerned about the lack of coherent organization across the diverse range of manufacturing operations that made up the BL empire - at the time of the government take-over there were of the order of 60 different manufacturing plants within the firm.Finally,the Report stressed the need for improvement in BL's industrial relations record.It noted a steady increase in the number of man-hours lost due to strikes,reaching a peak of 23.8 million in 1973-74.

The solutions prescribed in the Report proceeded to call for action on many fronts.In order to remedy

the long years of under-investment,a huge programme of capital investment in new products and facilities was proposed - to be heavily supported by government funding. Ryder envisaged a total capital expenditure of over £2,000 million (inflated prices) up to 1982.As Table One illustrates,the major part of this was to go to the car operations ; around £1,000 million was allocated to new models and 'facelifts',with over £400 million being spent on the modernization of production facilities.

TABLE ONE

	1975	'76	'77	'78	'79	'80	'81	'82	Total
Car operations	83	106	167	249	249	262	255	204	1,575
Truck and Bus	7	37	64	64	43	48	43	40	346
Special Products	4	8	6	6	8	15	8	7	62
International	8	18	11	12	16	20	14	8	107
TOTAL (inflated prices)	102	169	248	331	316	345	320	259	2,090

RYDER REPORT : BL's CAPITAL EXPENDITURE REQUIREMENT

(£million)

Source : Ryder Report,p.61

Ryder further proposed that government funding of this programme would amount to around two-thirds of the total ; that is,£1,300 - £1,400 million.

Apart from allocation of capital spending,which at least secured BL's financial future,the other main

items involved,firstly,a thorough rationalization of both the product-range and production,and secondly a re-ordering of BL's system of industrial relations. The first item was to be secured by a streamlining of BL's product portfolio towards a greater commonality of body-shells and engines - at that time BL were producing a total of nine different body-shells and twelve basic engine-types.Further,there was to be a complete re-organization of the firm's production facilities to encourage the best pooling of engineering skills and resources.A similar rationalization was also envisaged for BL's wage bargaining methods.But this was to be complemented by a system of worker participation,which Ryder felt was necessary both to reduce the number of disputes within the firm and also to improve worker 'attitudes' and hence productivity.

Essentially,the Ryder Plan viewed BL's problems in terms of the constraints on production exerted by under-investment,poor organization and dispute-ridden industrial relations.The Report was optimistic about BL's market prospects if these problems could be solved.It envisaged a 35% increase in car production over the period to 1985,and saw BL retaining around 33% of the U.K. market (against 31% in 1975) and increasing its share of the West European market to 3.9%.Thus,although the Report opposed any major 'green field' developments,it suggested that,by the modernization of facilities and the removal of other constraints,a major increase in BL's

production volumes could be achieved - from 605,000 cars in 1975 to 956,000 cars by 1985.This order of expansion would thus finally secure the kind of economies of scale which the firm had long hoped to achieve.It would also assure BL an important place in the market alongside the major European producers (18).

One of the means to attaining these projected levels of output was to be a new model in the small/light sector of the market.Ryder's decision to proceed with this project was influenced by a number of factors.Not only was there a need to replace the long-lived Mini,but there were many strategic and political factors to take into account too.Of itself representation in this sector of the market was a potential strength,but this was buttressed by the political argument ; "If BL were to opt out of this sector of the market there would undoubtedly be a very substantial increase in our imports...It ought therefore to be both in BL's interest and in the national interest to remain in the small/light sectors of the car market." (19) Even if the oil crisis had not underlined the growth potential of this sector, it seems likely that the latter argument would have been sufficient to justify British Leyland's small car venture. This area of the market was one of the most heavily penetrated by foreign imports,and to abandon it to Fiat, Renault and the rest would have severe balance of payment disadvantages.The government involvement thus meant that the new small car - initially code-named AD088,later LC8 and finally Mini Metro - would be serving the national economic interest as much as BL's own commercial market

objectives.Yet,given the extent of government support for BL,this coalition of political and economic goals seems to have been largely inevitable.

Perhaps more important flaws in the Report,however, were those highlighted by subsequent governmental and parliamentary analyses of the U.K. motor-industry.Shortly after the publication of the Ryder Plan for BL,the government's 'think-tank' - the Central Policy Review Staff - produced its own report on the motor-industry,and this seems to suggest important qualifications to some of the assumptions made by Ryder and his team.In particular,the C.P.R.S. made the important point that the link between capital expenditure and labour productivity might not be as direct and deterministic as Ryder implied.It noted that some of the substantial weaknesses in BL's productivity performance could not be attributed to capital investment alone.For example ;

> "Although the Leyland Mini is built and assembled at Longbridge in old facilities and with old equipment,man hours per car could be reduced by 32% just by achieving the work standards calculated on the basis of existing equipment...capital expenditure by itself will not improve productivity or quality or reduce manufacturing costs." (20)

The C.P.R.S. report claimed that around 60% of capital investment in the motor-industry was related to the introduction of new models and therefore could have little or no direct effect on productive efficiency. However,in one sense,for all its qualifications the C.P.R.S. analysis was in accord with Ryder in highlighting

the productivity question as critical to BL's survival. Furthermore,it also agreed with Ryder's emphasis on the need for a 'change in attitudes' on the part of the work-force if a real improvement in productivity was to be attained.

While C.P.R.S. had found fault with some of the mechanics of Ryder's analysis,a report from the House of Commons Expenditure Committee was even more critical inasmuch as it questioned some of the fundamental financial parameters of the Ryder Plan.(21).The Expenditure Committee was particularly concerned about the financial forecasts made in the Ryder Report.These forecasts of future profitability had formed the basis for the planned programme of capital expenditure,and had also established the proposed levels of government funding for BL.However,the Committee cast a critical eye over Ryder's estimates,noting sceptically "if BLMC were to earn such profits it would be more profitable than any large European motor manufacturer has yet been" (22).Moreover,the Committee commented on the sensitivity of Ryder's estimates that "it must be clearly understood that Ryder's profit forecasts are vulnerable to relatively small deviations from the assumptions it makes in the Report" (23).

Ultimately,both the C.P.R.S. and the Expenditure Committee's conclusions seem to have a degree of validity. But,insofar as the financial arrangements of the Ryder

Plan,particularly the provision for government finance,proved to be the most critically insecure aspects of Ryder's prescription,the Expenditure Committee's comments seem to carry the greatest prophetic weight.Indeed,whatever the differences in emphasis between Ryder and the C.P.R.S.,both reports seem to be so coloured by the political necessity of BL's survival that their analysis of the financial implications of rescue assumed a secondary importance.In that sense,both of the government reports relating to BL,which were to have a crucial bearing on the firm's future strategy,were based upon one central political assumption ; namely,that as a Department of Industry report put it,"the importance of the motor industry to the balance of payments,to employment and to the industrial structure of the U.K. make it imperative to achieve a substantial and viable volume car-industry in this country." (24)

The Metro Project and the rationalization of BL

With the assurance of government support,in 1976 BL's product and process engineers were finally able to go ahead with their project for a Mini replacement. The design chosen from a number of prototypes,the ADO (Austin Design Office)88,was to be an up-dated,slightly enlarged hatchback version of the Mini.However,fairly soon after the inception of the ADO88 programme,certain doubts began to appear as to the consumer appeal of the design.On the appointment of Sir Michael Edwardes

as BL's chief executive in October 1977,and with the prompting of a poor consumer response at a 'design clinic' in Leeds,it was decided to implement major modifications to this design.For the new LC (Leyland Cars)8 design,later to be the Metro,the entire 'skin' was changed,with every body panel but the bonnet being either re-designed or replaced.

The changes carried out on the AD088 design,however, were only presaging even more drastic surgery on the shape of BL itself.The very fact that the firm was only finally committed to a small car design late in 1977, some two years after the Ryder Report,serves to underline BL's troubled state at this point.After a damaging toolmakers' strike in the spring of 1977,the Ryder Plan had been officially abandoned,and the government had imposed a freeze on capital spending.With the LC8's launch planned for 1980,BL's market performance now depended upon an ageing model range that was three years from renewal.The Ryder Report's assumptions of a secure home market-share now seemed,to say the least, over-optimistic (see Figure Two) - especially in view of an increasing consumer preference for imported cars, coupled with the fact that in 1977 Ford's market-share exceeded BL's for the first time.Thus,the appointment of Sir Michael Edwardes was itself expressive of the government's intentions.The trend of government thinking seemed to be revealed when,at his first meeting with BL trade union officials,Sir Michael Edwardes told them

bluntly ; "The idea that we should agree to produce the number of vehicles that fits the number of people we employ isn't on." (25)

From September 1978 to September 1979,16,000 jobs were cut within BL as a whole,but the firm's continuing precipitous decline in market-share prompted an even more drastic rationalization at the end of 1979.The so-called 'Edwardes Plan' entailed the loss of another 25,000 jobs from BL's work-force of 165,000.Major and permanent reductions in capacity were implemented, with the closure of 13 manufacturing plants.The new strategy thus represented a conclusive rejection of the expansionist plans of Sir Don Ryder.Under the pressure of crumbling demand,the kinds of rationalization that Ryder had envisaged as removing constraints on BL's ability to supply were turned in a completely different direction.The new strategy focussed on the streamlining of the firm,reducing its financial losses,and securing its survival until the renewal of the model range had been properly set in motion.(26).However,while management pursued 'de-manning' as a method of improving productivity,the reduction of BL's manufacturing capacity effectively represented the abandonment of any prospect of achieving a position alongside the major European producers.In fact,as Table Two illustrates, from 1972 to 1979 BL's production volume was almost halved,putting it on a par with firms such as Daimler-Benz and well behind the mass-market producers. BL's decline over this period was matched only by that

TABLE TWO

1972		1979	
1.	General Motors	1.	General Motors
	7,356,898		8,533,742
2.	Ford	2.	Ford
	5,224,090		5,230,383
3.	Chrysler	3.	Toyota
	2,832,963		2,996,225
4.	Fiat	4.	Fiat
	2,366,422		2,976,022
5.	VW-Audi-NSU	5.	Nissan
	2,203,362		2,704,544
6.	Toyota	6.	VW-Audi-NSU
	2,087,133		2,530,565
7.	Nissan	7.	Peugeot-Citroen
	1.885,816		2,425,798
8.	Renault	8.	Renault
	1,351,311		1,945,289
9.	British Leyland	9.	Chrysler
	1,056,317		1,429,082
10.	Peugeot-Citroen	10.	Toyo Kyogo
	671,139		971,421
11.	Toyo Kyogo	11.	Mitsubishi
	640,624		938,517
12.	Daimler Benz	12.	Honda
	462,113		801,869
13.	Mitsubishi	13.	British Leyland
	444,332		657,637
14.	A.M.C	14.	Daimler Benz
	383,229		604,859
15.	Honda	15.	Isuzu
	330,569		424,788
16.	Volvo	16.	Suzuki
	252,413		344,935
17.	Suzuki	17.	A.M.C
	210,210		343,194
18.	Moskvitch	18.	Volvo
	205,000		336,437
19.	Isuzu	19.	BMW
	182,949		328,281
20.	BMW	20.	Moskvitch
	182,858		325,000

TWENTY LARGEST WORLD CAR MANUFACTURERS,

RANKED BY PRODUCTION : 1972 AND 1979

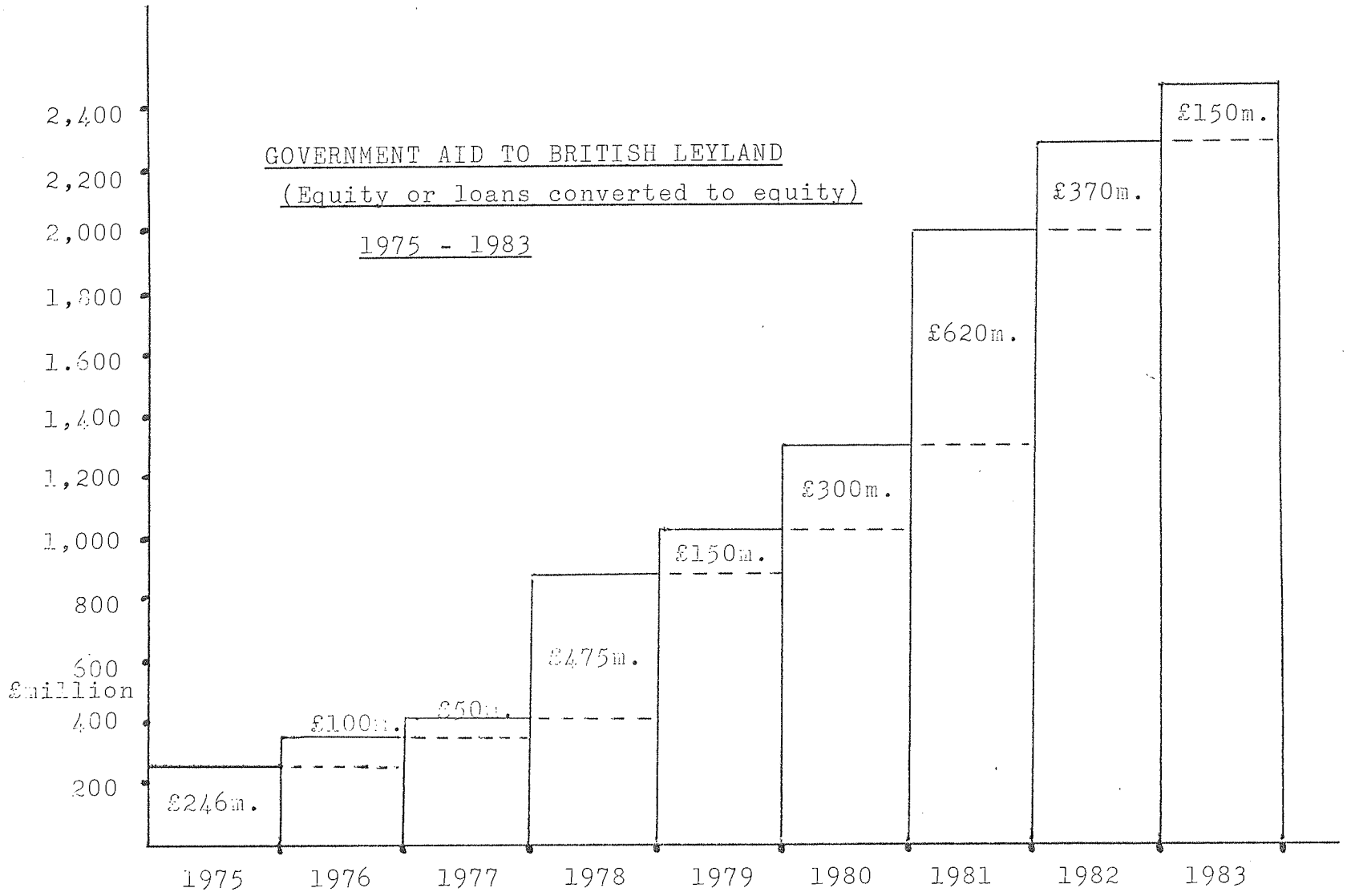
Source : U.S. Transportation Systems Center,
(Cambridge,Mass. U.S.A.)

of Chrysler.

By 1979,with BL no nearer to achieving a stable share of the home market,management's determination to force through redundancies and plant closures was further increased.In a paradoxical turn of events,the downturn in demand for BL products,together with the election of an unsympathetic Conservative government in early 1979,had effectively strengthened management's resolve.The BL Board were able to present their actions as the purging of surplus capacity or inefficient operations,even though their actions took on the character of a phased shut-down of the firm.They were even able to win a degree of short-lived support from the BL work-force.This proved particularly important insofar as it helped to secure further government aid, for BL's dependence on government funding - closures and redundancies notwithstanding - had actually increased since the end of the capital spending freeze in 1977.

Despite the massive sums provided by the government, the firm showed little sign of achieving a profit on its operations.In fact,in 1978 and 1979 the cost of the 'Edwardes Plan' added considerably to BL's financial deficit - producing a total balance-sheet loss of £37.7 million in 1978 and £144.5 million in 1979.(27) Meanwhile,as Figure Three illustrates,the amount of aid provided by the government,far from declining as predicted by the Ryder Plan,actually seemed set on an

FIGURE THREE



escalating course.Thus although the government gave its approval to BL's 1980 Corporate Plan in December 1979 (28),its avowed reluctance to provide further financial support (29) became an increasingly important constraint upon the management and strategy of the firm. In effect,the justification for BL's survival came to rest upon the government's view of the firm's future prospects.As Sir Michael Edwardes put it ; "You don't close a firm because it's unprofitable.You close it because it's unviable." (30)

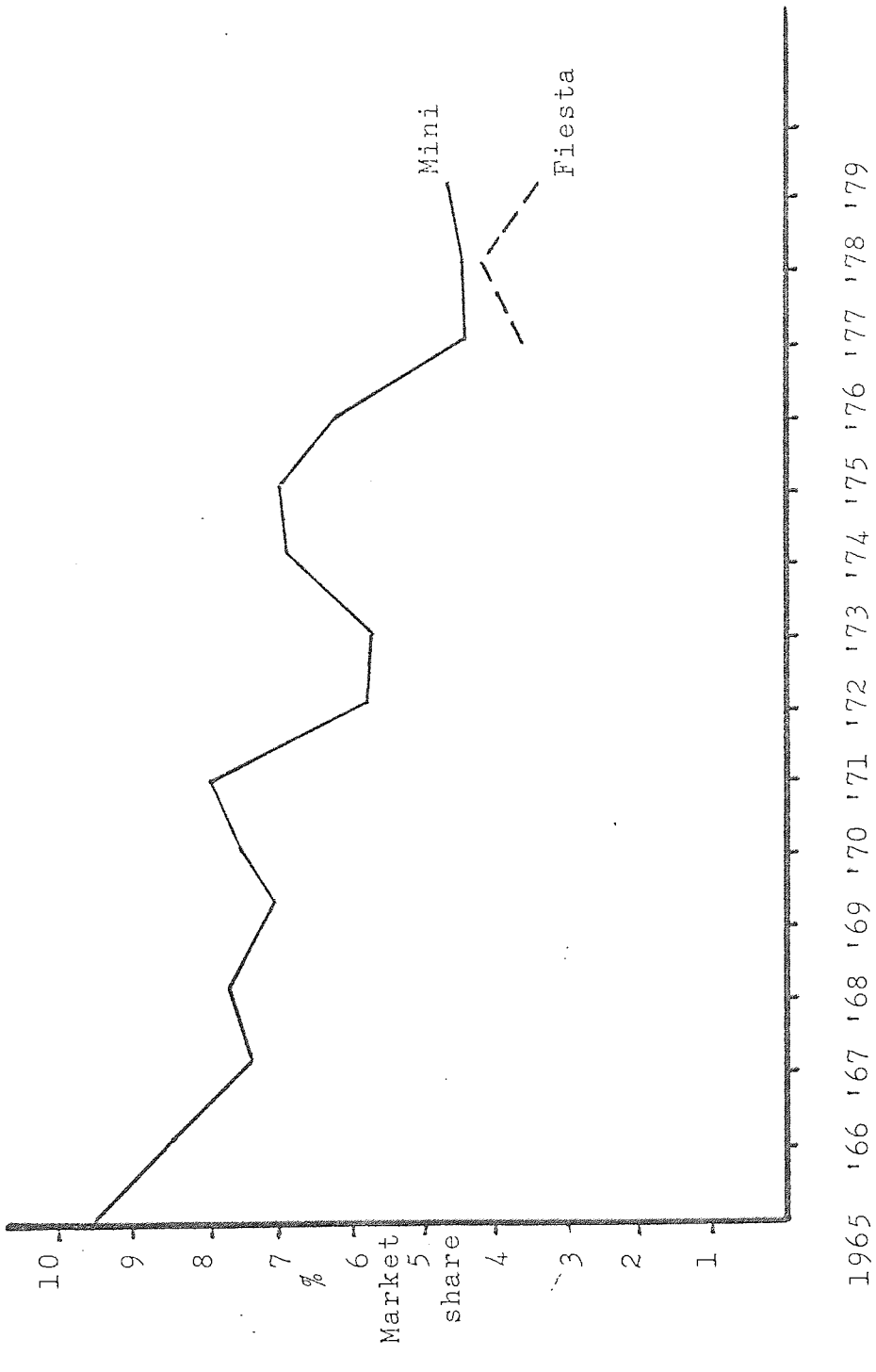
Much of the burden for proving BL's 'viability' now fell squarely upon the Metro itself,as the first element in the revitalization of BL's model range.As the Financial Times noted in July 1980,"the launch of the Metro should provide the right political atmosphere for Sir Michael Edwardes..to go back to the government for further financial help" (31).While the new model had been a major component of policy in the Ryder Plan,if anything the Metro's strategic status had been given further emphasis by the Edwardes' rationalizations.Not only was it to play a vital role in persuading the government of BL's commercial prospects,but the 'streamlining' of BL's production capacity lent it an even greater significance as the means by which the modernization of a key plant could be implemented.

The immediate significance of the new model,however, lay in the simple fact that BL badly needed a boost to

its sales.As home market-share slumped even more badly in 1980,threatening mass defections from BL's 1,900 strong dealer network,the Metro Project took on an added air of critical urgency.Management could take comfort,however,from the car's favourable market prospects.Certainly,in terms of the Continental market the Metro seemed to be 'targetted' at the strongest market segment ; in both 1978 and 1979,four of the top six best-selling cars in Europe were from the small-car segment (VW Golf,Fiat 127,Renault 5,Ford Fiesta) (32). In Britain the small-car segment had grown from 9% of total new car sales in 1970 to 18% in 1980,and thus underlined the need for stronger representation in this area of the market.Since,as Figure Four illustrates,the Mini's share of the U.K. market was slowly but inexorably being eroded by newer models such as Ford's Fiesta,the Metro was badly needed to preserve BL's once dominant position in this sector.BL management hoped to take around 6% of the total U.K. market by the addition of the Metro to their range,and further planned to use it as the basis for re-building sales on the Continent.

Thus,despite Edwardes' insistence on the overriding importance of BL's future LC 10 mid-range model (to be launched in 1982 or 1983),by 1980 the Metro had become the vital element in assuring the firm's survival. The kind of symbolic significance that attached to the Metro was only partly attributable to the remarkable fact that it was the Austin-Morris division's first new

FIGURE FOUR



U.K. MARKET SHARES, BL's Mini and FORD's Fiesta

1965-1979

Source : Society of Motor Manufacturers and Traders (S.M.M.T.)

model for five years.Perhaps the most important aspect of the new model was its role in persuading both the government and the public at large (33) that BL was capable of reversing the decline in its fortunes.

BL's 1980 Corporate Plan (34)

Clearly,BL's £285 million investment in the Metro was a major element in the firm's corporate planning. In some respects the new car was really a hangover from the Ryder Plan,where it had been part of the expansionist aim of developing a comprehensive range to encompass the whole market.Under the Edwardes strategy,though part of a more selective product portfolio,the Metro played an equally important role.Indeed evidence from BL's 1980 Plan underlines the importance attached to the performance of the new model.As Table Three indicates,the Metro,by increasing BL's market penetration in the small/light sector,was to provide the greatest contribution to the firm's gradual improvement in market-share.

TABLE THREE

Market Sector	1979	1980	1981	1982	1983	1984	1985
Small/Light	4.9	4.7	7.6	6.8	6.3	6.4	6.4
Medium	10.6	10.0	8.6	7.6	8.2	11.4	11.8
Large	1.8	2.0	2.0	2.4	2.3	1.8	2.0
Executive/ Prestige	2.1	2.5	2.6	2.9	3.2	3.2	3.3
Sports etc.	1.0	1.3	1.0	1.1	1.1	1.1	1.1
Total share :	20.4	20.5	21.8	20.8	21.1	23.9	24.6

BL MARKET PENETRATION : SALES FORECASTS,1979-85 (35)

In the terms of the 1980 Plan, the Metro was to be the first model in a new compact model range. Excluding 'facelifts' and 'derivatives', the Metro in tandem with the mid-range LC 10 was to cover the greatest part of the market ; the Metro was directed at what might be termed the 'Household' segment, which made up 25% of the market, and the LC 10 was to cover the Family and Business segments which made up another 50% or so. (36). By defining the model range in this way, BL management effectively acquiesced in the prevailing market trends which allotted BL only a relatively minor place in an increasingly import-dominated U.K. market. The modest ambition of climbing back to 25% of the home market was a far cry from the 33% posited by Ryder, and even this reduced expectation depended on the success of the new models in an uncertain and highly competitive market-place. According to Sir Michael Edwardes, BL aimed to secure a profitable niche in the market not by direct large-scale competition with the major producers, but on the basis of a 'specialist' approach, emphasizing quality and distinction. As he explained ;

> "We are specialist car producers with Jaguar at the prestige end, Rover for the executive sector and then high economy family cars with Metro and LC10. We have got away from trying to produce a comprehensive range of fifteen models as a volume car producer." (37)

Even the diminished scale of operations and model turnover envisaged by the 1980 Plan demanded the

application of resources on a far larger scale than BL could provide for itself.The 1980 Plan detailed a capital spending programme of around £300 million each year from 1980 to 1985,making a total expenditure of over £1800 million in that period.Around 60% of this was to be financed internally from depreciation and profits - a dramatic contrast with the firm's record from 1975 to 1979 when a mere 16% of BL's capital requirement of £1,136 was internally generated (38).

However,even assuming that BL could achieve the anticipated order of profitability,the 1980 Plan's proposals on capital investment seem of dubious validity simply in terms of the scale of expenditure envisaged. As Table Four indicates,the comparison of BL's investment plans with those of the other major European producers suggests that the Corporate Plan's provisions would scarcely allow BL to regain competitiveness against the other volume manufacturers.At the very least,the levels of spending projected would seem to involve a severe financial stringency for BL in the period to 1985.As Ford were claiming at this time that a minimum of £450 million was needed for the launch of a new model,the prospects of BL achieving the successful introduction of its many forthcoming new models seemed to be heavily constrained by its capital spending limits.Towards the end of 1979,for instance,an internal A.S.T.M.S. memo (40) noted that BL were hoping to minimize the investment cost of the LC10 by producing it from the,slightly

TABLE FOUR

B.M.W. : £750-1,000 million over three to four years to modernize production facilities and renew product range.

Daimler-Benz : £2,000 million from 1979 to 1983 to increase capacity to 420,000 cars per annum.New facility to manufacture a smaller model in the Mercedes range.

Fiat : £2,300 million over five years in rationalization and product development.

Ford (UK) : £1,800 million from 1978 to 1982,including construction of a new engine plant at Bridgend in South Wales,and new facilities at Halewood to produce the new 'Escort'.

General Motors (Europe) : £2,000 million investment,increasing European capacity by 300,000 cars per annum.New assembly plant at Saragossa,new engine plant near Vienna.

PSA (Peugeot-Citroen) : £4,000 million from 1978 to 1982.New models to be developed from a common pool of components.

Renault : £4,100 million from 1978 to 1982.

Volkswagen : In 1978 capital investment of £475 million. Plans to spend £2,250 million from 1979 to 1982,mainly in expanding production from plants in U.S.A. and Mexico.

INVESTMENT PLANS,MAJOR EUROPEAN PRODUCERS (1979)

Sources : Financial Times various and K.Bhashkar (39)

modified,Allegro line at Longbridge.As the memo comments, this kind of parsimonious approach to the launch of a new model could only be "a certain recipe for disaster" (41).Indeed,the very fact that BL management were even considering such an option for a model which was absolutely critical to the firm's survival - and one,moreover,which was supposed to compete on the basis of design and quality - serves to cast a great deal of doubt over the whole Corporate Plan.

The Metro and the 'World Car'

The financial cheeseparing of the 1980 Plan only reflected the convolutions of a deeper financial crisis which beset BL at this time.Given that the seemingly never-ending flow of government aid had produced little perceptible result in terms of profitability,BL seemed in real danger at this point of becoming what Lee (42) describes as 'a financial black-hole'.The implications of the firm's grave position,which are detailed in Appendix One,seem to have represented one of the most unsettling medium and long-term threats to the 1980 strategy,and indeed to the firm's survival itself.

However,while the financial outlook was certainly an important constraint upon management's freedom of action,it seems that,excluding a major change in government policy,the basic determinant of BL's survival at this juncture was simply its performance in the market. Whatever the success or failure of the Metro in marketing

terms,BL's ability to survive in an intensely competitive U.K. and European market depended upon the overall strategy embodied by the 1980 Plan.

It is an important point to note,then,that a comparison of BL's 1980 strategy with strategies undertaken by most other major producers reveals a number of major weaknesses on BL's part.Perhaps the most important of these weaknesses is to do with BL's strategy for production,finding particularly acute expression in the way that BL management organized production for the Metro itself.While firms such as Renault,Ford and General Motors all announced in 1980 their intentions to move some way towards the so-called 'World Car' (43) concept (cars to be manufactured and marketed on a world-wide basis),the rationale behind Metro production seemed parochial by comparison.The Metro was to be assembled at one plant only - i.e. Longbridge - and most of the parts and fittings would also be sourced from Longbridge.It would not be manufactured from an international production infrastructure - indeed,BL management planned to phase out the company's last remaining Continental plant at Seneffe (the last remnant of the ambitious plans of the early 1970's) by 1981.This would leave BL virtually without any overseas manufacturing interests in the car sector.

In direct contrast,the new Ford Escort,which was launched just before the Metro,was to be produced on a world-wide basis from plants in the U.S.A.,Japan and

Europe.For the European Escort,assembled at both Halewood and Saarlouis,components were to be 'sourced' from a total of 16 different countries,including almost all the E.E.C. countries,together with the U.S.A.,Japan, Canada,and so on (44).In part,this 'World Car' strategy so ardently pursued by Ford and other producers was the result of changes in the American home market.As Jones explains ; "With the rapid change in consumer preferences in the U.S. in the 1970's,the main world markets are for the first time in many decades purchasing similar cars.This raises new possibilities of integrating car production worldwide." (45) However,the change in the U.S. market was only one of many factors contributing to this tendency.In the case of Ford,for instance,the firm's moves towards the 'World Car' and away from the economic nationalism pursued by BL can be traced back well beyond the 1970's.In fact,as early as 1959 when Ford U.S.A. bought out the remaining 45% of Ford U.K.'s equity,the managerial rationale behind the acquisition was presented in the following way ; "Our objective is to obtain greater operational flexibility and enable us better to coordinate our European and American manufacturing facilities,and integrate further our product lines and operations on a worldwide basis." (46) At this time,BMC,Jaguar,Leyland,Rover and Standard-Triumph were all still operating as independent firms.

Within a few years Ford began to make good their original aims,such that in 1967 the Ford companies

in the U.K. and Germany were reorganized to form 'Ford Europe'.Almost immediately on the formation of this new grouping,Ford began to reap the advantages of multinational cooperation.In the late 1960's the design and engineering time for the new 'Capri',which was developed and marketed in both Britain and Germany, was cut by around 50% (47).Within the space of the following decade,Ford's continued pursuit of such advantages had reached such a pitch of coordination and integration that its product portfolio had come to resemble almost an idealized model of the 'internationalization' (48) of production : at this time,Ford sourced 'Fiestas' from Spain,'Escorts' from West Germany,Eire and the U.K.,'Cortinas' from Belgium,Eire and the U.K.,and 'Capris' and 'Granadas' from West Germany (49).

Thus,for Ford the launch of the new Escort in the autumn of 1980 was simply the next step on a well-trodden path.With a total investment of £1,200 million (£300 million in the U.K.),the different versions of the Escort were manufactured and distributed throughout Europe,the U.S.A.,South East Asia and Australasia. Although the Escort was not fully a 'World Car' in that there were still a number of significant variations in the design of its different versions,nevertheless certain fundamental commonalities in design and components sourcing offered major benefits.Ford's chairman outlined these benefits in the following way :

> "There are more common brains in it (the Escort) than common parts.But there is also a similarity in processing made possible by the world car approach.Common engineering is not just applied to the car,it applies to manufacturing also..The advantage is that you can develop a family of cars with only slight modifications,that is quite a progress over having two different projects side by side.Now,for certain types of components,there is opportunity for exchange.There could be more in the future." (50)

Ford further claimed that the pooling of its world-wide effort actually saved over $150 million on engineering, tools and facilities,and in terms of human resources 15,000 engineering man-years were cut from the design budget.

Clearly,the example set by Ford was not something which BL could hope to emulate.Although in 1979 BL had entered into a partnership agreement with Honda of Japan to assemble a Honda model - the 'Acclaim' - at Cowley,this was fairly limited in scope and seemed to represent simply a 'stop gap' measure until the arrival of the LC 10 in 1983.In effect,the advantages of world-wide production that were being assiduously pursued by Ford were largely out of BL's reach.Against the backdrop of the 'World Car' strategies of other firms,the 1980 Corporate Plan seemed to envisage in essence a penurious BL,eking out its resources to launch a small,under-financed range of cars on an uncertain market.

The weaknesses of this strategy compared to Ford's,

say,seem fairly apparent.Firstly,there is the general problem of the scale of operations.The abandonment of Ryder's expansionist aims in favour of the reduced ambitions of the 1980 Plan meant that,as Table Five indicates,production volumes,even after a gradual increase,would still be less than 900,000 per annum by 1985.Thus,in comparison with the 2 million cars per annum produced by the eight largest producers in 1979, BL's ability to compete in terms of scale economies was limited.Indeed this view receives further support from a report by the 'Eurofinance' consultancy group,which was commissioned by the T+G.W.U. in 1980.The Eurofinance report (51),commented bluntly on the 1980 Plan that "with this configuration,BL will not be able to achieve manufacturing scale economies matching those of its European competitors and will fall well behind the Japanese and Americans" (52).

TABLE FIVE

	1979	1980	1981	1982	1983	1984	1985
Austin-Morris	461	407	449	464	523	608	643
J.R.T.*	158	166	132	123	129	128	140
Land Rover	63	72	77	85	90	97	100
Total	682	645	659	672	742	833	882

WORLDWIDE UNIT SALES FORECAST (000s)

Source : BL 1980 Corporate Plan

Furthermore,although BL's 1980 strategy projected substantial increases in labour productivity (an increase of 58% from 1979-82 for Austin-Morris alone),Eurofinance made the point that by itself a rise in BL's productivity could do relatively little to offset the firm's lack of scale economies.In particular,the Eurofinance Report focussed on the area of components production, which was a major element in the 'World Car' strategies of almost all the major manufacturers.Noting that,on average,'bought-out' components accounted for around 60% of the total costs of the major European producers.(53). Eurofinance claimed that "the key to an understanding of the importance of the size factor in car manufacturing lies in the distinction between economies of scale and productivity in vehicle assembly on the one hand, and component production/procurement on the other" (54). As a result,it argued,improvements in the productivity of assembly labour were comparatively unimportant unless they were accompanied by the long production runs needed to secure the considerable economies in component production.It claimed that "all the car assembly robots in the world do not alter the fact that the price of bought-out components varies directly with the size of order placed" (55).

Given its analysis of production economies,and the added problem of increasingly burdensome product development costs on BL,the implications of the Eurofinance

Report were clear.Unless BL developed a much more comprehensive partnership deal than the limited projects already envisaged (56),it would be unable to achieve the kinds of scale economies that were vital to withstanding the competition of the 'World Car' producers. Only if some extensive collaboration were pursued could BL remain in the business of manufacturing rather than simply assembling cars.As an internal T+G.W.U. memo noted ; "BL has a choice.It can either aim to be part of the big league of producers making around 1½ million vehicles a year (in a partnership),or it can retain its present frontiers which dictate a slow decline,to around 250,000 vehicles a year." (57)

By the end of 1980,for all the commotion surrounding the launch of the Metro,the long-term future of BL seemed uncertain.Management had made few moves towards the kind of strategy argued by the Eurofinance Report.Consequently,with little sign of BL securing the objectives of scale and collaboration so cogently presented in that report,the financial weakness of the firm was supplemented by long-term and even more pressing doubts about the firm's ability to survive in the era of the 'World Car'.Indeed the performance of the Metro appeared relatively insignificant when set against the major doubts which hung over BL's corporate strategy.

Conclusion

Given the scale and complexity of the subject, the foregoing account of BL's troubled development in the period to 1980 can only be regarded as very partial in scope. For example, it barely touches upon the massive reductions in manpower that took place during this period : in fact, from December 1977 to December 1980 the rationalization programme implemented by Sir Michael Edwardes involved a reduction in BL's worldwide manpower from 198,000 to 141,000 (58). Nor has there been any detailed description of the crucial if complex topic of BL's relationship with the governments of the day.

All in all, however, the unravelling of some of the complexities of BL's history seems to have produced at least one definite conclusion ; namely, that the factors of organization structure and strategy have played an important part in determining the scale and type of investment in manufacturing facilities. BL's ability to pursue manufacturing economies of scale, for instance, seems to have been closely linked to the evolution of BL's strategy and structure during this period. While the new facilities at Longbridge were geared to high volume, highly capital-intensive production, the decline in BL's market-share of the late 1970's effectively put paid to the strategy on which they were based and hence made it unlikely that new facilities would be so designed in the future. BL's inability to overcome its market problems and attain the levels of

production at which the greatest technical and commercial economies could be reaped seems to have severely constrained both the scale and character of investment which the firm could undertake.The BL-Honda 'Acclaim', for example,was to be manufactured at volumes of around 80,000 per annum,which could hardly secure the scale economies of car assembly,let alone of component production.

The down-scaling of production and reduced ambitions of the 1980 Plan,however,were more than the result of BL's failure to retain a stable home market-share or organize its production competitively.They were also clear indications of the extremely precarious position that the firm was placed in at this juncture - both in financial and political terms.Thus the Edwardes strategy's themes of retrenchment and rationalization seem to have represented a strategic adaptation to the straitened circumstances in which BL found itself,more than any free choice on management's part.Certainly,the pursuit of a parochial and centralizing policy in production,as expressed in the self-sufficiency of Metro production at Longbridge,could not be reckoned as in any sense an 'ideal' strategy in light of the plans pursued by the other major producers.

Even given its adaptive quality,however,the constraints and assumptions of the 1980 Corporate Plan seem to have affected BL on almost every level of its operations.Of its many consequences,the most important

seem to have been in the area of industrial relations, with the tenor of management-union relations being greatly affected by the kinds of management policy - streamlining' and 'de-manning' especially - embodied by the 1980 Corporate Plan.In particular,the corollary of BL's strategically isolated and vulnerable position ("the smallest and weakest full-line motor manufacturer in the world" according to Eurofinance (59)),was that the routes to efficiency open to the largest producers, notably scale and internationalization,were simply no longer accessible to BL.One major consequence of this was the impetus that it gave to management's search for ever higher levels of labour producvity. Admittedly,the objective of increasing productivity had been a persistent theme of management policy during the 1970's - one emphasized by both the Ryder and C.P.R.S. reports - and this applied to all the managerial regimes at BL in this period.And yet,it was only towards the end of the 1970's with the introduction of the Edwardes strategy that the drive for higher productivity attained the status of the most urgent and imperative priority,almost to the exclusion of anything else.It seems that in management's eyes the primary means of survival for a streamlined BL was to rest upon the extraction of substantially higher levels of effort from the production work-force.

In that sense,the 1970's saw the productivity question taking on a gradually evolving primacy in

both management's strategies and their relations with the work-force.The importance of this link between strategy and industrial relations is examined in more detail in the following chapter.

CHAPTER FIVE

INDUSTRIAL RELATIONS AT BRITISH LEYLAND

Introduction

Earlier chapters have served to indicate the importance of management-worker relations in the process of technological change. Although, as we noted, workers and unions in the motor industry seem to have exerted little influence over the direction of technological change, this is not to say that the labour-force has no significant role to play in the adoption and operation of new technologies. Indeed, while changes in technology are in the broadest sense a matter of management's 'strategic choice', at a detailed level such changes often have the primary purpose of securing control over this 'random' or 'refractory' human factor. Previous examples serve to underline Fox's comment ; "The fact that discretion can never be completely programmed out of any work role means that...there is always some quantum of power available if the role occupant has the aspiration to use it." (1) Further, as a result of such residual discretion, it may well be that technical change in the motor industry approximates to the model that has been put forward by Salerni. In Salerni's view technological change is essentially cyclical in character in that the productivity gains secured by new technology are continually being

eroded by the various evasions and strategems of the work-force,only then to be succeeded by a further phase of technological change (2).

However,as was noted earlier,of equal if not greater influence upon management's control of the production process are the job rights and practices imposed by collective worker organization.At the point of production, such exercises in work control and job protection may actually give further encouragement to management's propensity towards eliminating areas of 'labour unrest' by automation or mechanization.According to Gyllenhamar, one-time president of Volvo ; "The more workers try to protect their endangered jobs,the more planners and managers see their attitude as reason to design people out of the system." (3) Yet,beyond the technical compass of such attempts at a 'technological fix' (4) to secure what was termed the work-force's 'subordination within production',probably the most intractable managerial problem lies in the area of 'subordination to production' ; the attempt to foster the work-force's acceptance of and compliance to managerial objectives.

It is largely in this sense that the conduct of industrial relations as it is generally conceived becomes relevant to the topic of technological change.Beyond the technical nexus at the point of production,the more general questions of managerial authority and legitimacy (5) are in large part determined not by technology but

by the prevailing power balance and 'trust relations' (6) within the firm as a whole.Moreover,especially notable for the purposes of this chapter is the fact that management's strategy and its criteria of efficiency are secured not at shop-floor level alone,but firstly and primarily within the industrial relations system of the firm as a whole.

Thus,in dealing with the industrial relations structure and history of British Leyland,this chapter will focus on the various ways in which management have gained the acquiescence of the work-force to successive,and more and more severe corporate strategies. In particular,it will attempt to show how the firm's evolving strategy and structure either helped or hindered corporate management to achieve the notions of efficiency that underpinned their investment programmes. To cite an obvious example of this important link between strategic efficiency and corporate industrial relations ; there is a clear contrast between,on the one hand,BL as a 'National Direct Exporter' (7) and state-owned firm with its intensely political struggles over management's rationalization strategies,and,on the other,Ford as a U.S. multi-national with its comparative ease in implementing strategic decisions (8).As we will see,the strategic control of technological change seems to be closely bound up with management's ability to install its own version of efficiency against the contradictory claims of its workers.

Labour productivity and practices

An important indicator of managerial success in securing efficiency is the general level of labour productivity that it is able to extract from its work-force.As we will describe in later chapters,the parameter of 'man-hours per car' is probably the most important single measure of productive efficiency for managerial purposes,and the objective of further reducing that figure served as a major goal of the technological changes at Longbridge.However,although productivity is clearly of essential significance to management,there is no automatic guarantee that it can be installed as an overriding priority in the dynamics of management-worker relations.In fact, the greater part of this chapter will be concerned with the various means and methods employed by management at BL,in order to secure this kind of predominant status for efficiency and productivity.More particularly, our concern here is with the way in which,after many years of conciliation and concession to a powerful shop-floor union organization,management finally succeeded in subordinating that organization to a unilaterally-imposed programme of productivity goals and efficiency standards.

a) Productivity and mechanization

During the 1920's and 30's,the success of firms such as Austin and Morris rested upon their ability

to achieve substantial increases in labour productivity.The competitive advantage held by these predecessors to British Leyland lay largely in their implementation of an extensive re-organization of production that was based on mechanization and de-skilling.At the Morris works in Cowley,for instance,output per head doubled in the period from 1924 to 1934 (9).Even more dramatically,at Austin from 1922 to 1927 output per worker increased by more than five-fold (10).At the Longbridge plant,Austin,like many other firms but more effectively than most had reaped the benefits of introducing flow-line methods,mechanization and above all else the de-skilling of work.Engelbach,Works Director at Longbridge,argued,as Church notes,that "the striking improvements in productivity were due in large measure to the practice of employing unskilled labour which the new investment programme made possible" (11).

At this time,there was,as the natural corollary of such changes,a good deal of resistance to the introduction of unskilled labour on the part of the skilled workers at the plant.In 1921,for example,the 'Tinplate,Sheet Metal Workers and Braziers Society' struck against management's de-skilling policies,and in 1924 the skilled body-workers came out on strike against the introduction of semi-skilled labour in their area (12).Although the skilled workers were quick to organize against de-skilling,by the mid-30's it was the unskilled labour itself which furnished the

material for the unions' recruiting drives.When a major strike broke out in 1936 at Longbridge (13) - over piecework rates - the unions had succeeded in bringing substantial numbers of unskilled workers within their fold.Already,however,the multiplicity of unions involved in recruitment - notably the T+G.W.U.,the A.E.U. and the National Union of Vehicle Builders - had begun to presage the kinds of inter-union rivalry and multi-unionism which were to be a characteristic feature of industrial relations in British Leyland : by 1975 union membership in BL was split between a total of 17 different organizations.

During the post-war period,mechanization and the spread of union organization continued apace,stimulated by the general growth and expansion of the U.K. industry ; from 1945 to 1967,employment in the industry grew from 150 to 250,000 workers (14).Along with this economic expansion went the development and consolidation of trade union power at shop-floor level.For example,by 1953 the Austin shop stewards had succeeded in securing some official recognition from management,(15) and in 1956 the management of BMC agreed to meet the shop-stewards' committee for the first time.However, although this was a period of extensive technological change - with labour productivity in the industry as a whole increasing by 138% between 1948 and 1959 (16) - the 'salience' of this change in industrial relations terms seems to have diminished.Turner,Clack and Roberts in

their 1967 study of the industry came to the conclusion that mechanization per se had played relatively little part in management-union conflict in this period (17).In large part,this seems to have been because the mechanization of production had relatively little de-skilling effect on a work-force that was already mainly de-skilled, and only served,in fact,to re-distribute employment between blue and white-collar occupations (18).

At Longbridge,the general trends within the industry were reflected in the installation of a number of new technologies.By 1955 Austin were operating a total of 70 in-line transfer machines plus 70 rotary machines in engine manufacture.There was also a great extension of the use of power-driven conveyor belts,fork-lifts and pneumatically or electrically driven hand-tools.Changes of this kind helped to secure further substantial increases in productivity at the plant.At Longbridge in 1939,19,000 workers had produced an average of 1700 cars per 52½ hour week.By 1960, however,23,000 workers were able to produce 6750 cars per 42½ hour week - representing,in effect,an increase in labour productivity of the order of 400% (19).

Yet,irrespective of the absolute gains in productivity yielded by technological change,by the 1960's there were clear signs that the U.K. industry as a whole was beginning to lose ground,in relative terms,

against its competitors on the Continent.Between 1961 and 1968 the industry's rate of increase in productivity slowed considerably,growing by only 23% in that seven year period (20).As Table One demonstrates there was an ever-increasing divergence between the home industry and one of its major rivals.

TABLE ONE

	U.K.	WEST GERMANY
1955	4.1	3.9
1965	5.8	6.4
1970	5.6	7.5
1973	5.8	7.7
1976	5.5	7.9

'Equivalent' Motor Vehicles Produced (per employee,per annum),U.K. and West Germany, 1955-1976

Source : D.J.Jones and S.J.Prais (21)

The increasing inferiority of the U.K. industry in terms of production efficiency can be attributed to a number of factors (22).However,there seems little doubt that the increasing strike-frequency of the industry played an important part.In terms of working days lost per annum,the industry's strike record,from being around twice the national average in 1945,

increased alarmingly to around six that times that figure by 1967 (23).Particularly badly-hit were the BMC and later BLMC factories.where the successive re-organizations of the firm,added to the growth of a powerful but fragmented (24) shop-floor trade unionism, resulted in a loss of any coherent management control of industrial relations.Thus,while the British industry as a whole slipped behind the productivity standards of its competitors,BMC and BLMC even began to lag behind domestic rivals such as Ford.In 1965,for instance, BMC produced 8.5 cars per employee against 9.7 at Ford U.K. and 16 at Volkswagen (25).Clearly,the disparity between BMC and Ford,which if anything was to increase in the coming years,cannot be attributed to industry-wide forces..Rather,the relevant factors,it seems,were those bearing upon the different methods of organizing production in the two firms.Undoubtedly the most important factor in this sense was the distinctively contrasting payment systems of the two.These different approaches to payment implied,as we will see, far more than just different ways of relating pay to production.

b) Piecework and Measured Day Work (MDW)

Unlike Ford,which had operated a time-rates payment system since its inception (workers being paid for attendance rather than output),BMC and BLMC's payment methods were based upon deep-rooted piecework systems.

Indeed,BMC had largely been built on piecework methods. The productivity increases achieved by Austin,for example, had,in Church's words,"owed something..to incentive systems based on a norm,the abolition of overtime, and the introduction of a timed piecework average with bonus payments on actual results..exceeding the norm" (26).

However,as BMC underwent its successive metamorpohoses in the 1960's,the retention of piece rates in its constituent companies only served to add to the already powerful centrifugal tendencies within the firm.The local,plant-level negotiation of piece rates meant that the national bargaining arrangements in the E.E.F. (Engineering Employers' Federation) had little or no effect on the insurgent shop-floor forces (27).Further,piecework gave a considerable boost to the role and power of shop-stewards within the plants.During the 1950's and 60's,the control of work at the point of production was heavily influenced by the piecework bargaining power of the stewards and gradually came under their sway.Derek Robinson described the situation at Longbridge thus :

> "The one feature that is perhaps important to understand on the piecework is that to a very great degree the individual or the group had a large measure of control over what they did and commensurate with their bargaining power they were able to exert pressures to bring about changes in price.." (28)

Although piecework encouraged shop-floor power in this way,it also served certain short-term interests of management itself - ensuring high output for a minimum outlay of managerial effort.As a labour relations executive at BMC noted ; "It does claw the work out of the factory..You get the men demanding parts from the foreman so that they can keep their earnings up..With this sort of incentive,the men do management's job for them to a certain extent." (29)

By the end of the 1960's,however,the long-term effects of piecework,particularly its erosion of management control,were becoming too critical to be ignored any longer (30).The creation of BLMC in 1968 had only rendered the problem more acute.As Salmon explains ;

> "Among the 34 plants that made up the merger of Leyland in 1968,differing customs,traditions and industrial relations practices existed.Senior management freely admitted loss of control of labour costs through the piecework system.In many instances the unions possessed the more reliable figures for wage payments." (31)

Pat Lowry,who became Industrial Relations Director for BLMC in 1970,was later to acknowledge the scale of the problem :

> "I have long believed that in the post-war conditions of a seller's market and an emphasis on production for home and export markets at virtually any price,many industrial relations problems were pushed under the carpet.Concessions were made that should have been resisted.Strikes were bought off." (32)

Lowry further noted that piecework had made any company-wide control of industrial relations very difficult because of "gross anomalies in pay between various groups of employees" (33).Most damaging of all, however,was "a loss by management of day-to-day control of its operations - in some plants the loss of control was virtually total" (34).

In light of its increasingly dysfunctional aspects, in October 1970 the BLMC Board finally decided to eliminate piecework,giving their consent to Lowry's plans for the introduction in its place of Measured Day Work (MDW) ; a fixed rate of pay unrelated to output,but based on the industrial engineers' work standards.In this move,BLMC management were following a major trend in the U.K. industry,since by this time all the other major manufacturers were operating day-rate systems.However,in installing MDW,Lowry was not only looking to the general tendencies within the industry at large,but was also concerned with the changing technological needs of car production.He saw the transition to MDW as being in accord with the increasingly capital-intensive character of production ;"In a modern automotive plant..there is less and less scope,or requirement for,variation in individual effort.Such a plant requires..a high degree of organizational efficiency on the part of management and a steady,assured, regular rate of output." (35).It was also evident in this regard that piecework systems hindered management's

ability to implement changes in technology.As the Economist noted in 1971,"as new machines are regularly introduced,new wage rates have to be agreed.As a rate is agreed for one lot of workers,another group elsewhere claims it is doing similar work for less money.This leads to perpetual wage leapfrogging and disputes." (36)

This linkage between MDW and technological change was clearly at the forefront of management's concerns when it came to the first major struggle over the installation of its new payment system.With the introduction of new production lines including a significant degree of mechanization for the launch of the Marina at Cowley,the issue was brought to a head.Despite considerable trade union resistance,management were eventually able to secure the installation of MDW on the basis of a monetary 'quid pro quo' in the spring of 1971.At Longbridge the process was less contentious,partly because it was introduced in a section-by-section manner.It was finally consolidated on a plant-wide basis in 1972,again backed by a 'quid pro quo' worth around £6 per week to each worker.Having secured its acceptance at these key plants,management went on to implement it elsewhere,such that,by 1974,94% of BL's work-force were being paid under "new or reformed payment systems" (37).

The primary motive behind the struggle to introduce MDW was clearly the conviction on management's part that it would lead to a perceptible improvement in their efficient control and deployment of the labour-force.However,

for all management's efforts and the costs of introduction,there is little evidence that MDW resulted in greater productive efficiency in BL plants.On the contrary,MDW actually seems to have increased the managerial problems of securing efficiency.As the House of Commons Expenditure Committee noted in its 1975 report on BL ; "Mr.Lowry's evidence suggested that the reduced incentive element of MDW has led to a degree of overmanning in BLMC." (38).

Although the failure of MDW to produce the anticipated gains in productivity and efficiency was to some degree a consequence of the generally turbulent character of management-union relations in Britain at this time,a good deal of its ineffectiveness can be attributed to intrinsic flaws in the system and its application.In itself,MDW was the first important step towards a more complete rationalization of wage bargaining at BL - finally achieved by the installation of 'parity' payments and centralized bargaining at the end of the 1970's. However,for an MDW system to be effective in this role, it depended upon two basic pre-conditions.Firstly,that,as Lowry himself noted,the adoption of new technologies by BL should render individual levels of effort largely irrelevant in the determination of productive efficiency. The fact that,after comparatively small investments for the Allegro and Marina,the anticipated stream of investment failed to materialize in the early 1970's, (39) severely limited MDW's ability to secure higher

labour productivity.

Secondly,and more importantly however,was the way in which MDW was introduced at plant-level.All the available evidence (40) suggests that the new work standards which were developed as the basis of MDW were often 'loose' or inaccurate.According to the C.P.R.S. Report,for example,"in many plants the change took place before soundly based manning levels were available.As a result many of the plants where MDW has been introduced are substantially overmanned" (41).This degree of 'over-manning' in BL was compounded by the need for a greatly increased supervisory presence on the production lines.As the Expenditure Committee reported ; "To some extent the piecework system supervised itself...instead of one foreman to 50 or 60 hourly rated employees,BLMC now employs one to every 20 or 25." (42)

As if the absence of this technical basis was not damaging enough to MDW's prospects of success,there was an added social element in undermining the effectiveness of the system.Given that management-worker relations in BL plants had historically been founded upon the crude equation of Money for Effort,the tendency of MDW to produce,as Flanders says,"the falling away of any persistent money motivation for maintaining standards of performance" (43) could only have grave implications. In the context of a plant such as Longbridge,the effect

of MDW was to reverse the calculative aspect of piece-work,depressing rather than stimulating effort.As one of the Longbridge work-force described ;

> "..there's no incentive to work.Why not take as long a tea-break as you can ? If you had the choice of sitting down and being paid at the end of the week,or working and being paid the same amount,which would you do ? It's only human nature." (44)

Clearly,in terms of the productivity effects of MDW,the rationality of the employment relationship was given further emphasis by the piecework history of BL,serving to minimize rather than maximize worker effort (45).

However,even this kind of social or historical constraint upon the operations of MDW might not have been so significant if management had succeeded in one of the original objectives of the introduction of the new system ; namely,sweeping away the shop stewards' bargaining power and replacing it with a much firmer managerial command of production (46).Although MDW eliminated the steward's role as a money bargainer,its crucial failure from management's point of view was that, by and large,it had very little impact upon his shop-floor power.Instead of acquiescing in management's production controls,the stewards simply re-oriented their efforts.Derek Robinson described the transition thus ;

> "..with standard day work..the argument changed from money to men.Now the conc-entration was not on losing men in order to push your earnings up but to man tracks to the highest conditions.To that degree it became a unifying force and we carried over from the piecework days the control that we had got into standard day work." (47)

The crucial significance of the stewards' ability to retain their shop-floor power under MDW was that it preserved an important political constraint upon the standards of efficiency imposed by management. In that sense,their shop-floor organization effectively acted as a buttress against what we described in an earlier chapter as 'labour's subordination to production'.Indeed,even within a technical framework determined by management,this kind of collective control - no matter how 'marginal' (48) - served to guarantee the workers' rights and interests against the goals and values pursued by management.

c) Mutuality

After the installation of MDW throughout BL,the shop stewards in many plants,including Longbridge,were able to secure formal recognition for their shop-floor power in agreements with management on 'mutuality' in establishing work standards.At Longbridge in particular,mutuality - the joint determination of standards and manning levels - was one of the major concessions in the agreement which secured the introduction of MDW at the plant.The relevant clauses in this agreement read as follows :

> "10. The Company recognizes that there is a need for full discussion with the Trade Union representatives and their members on all aspects of work standards."

"11. The Company accepts that mutual agreement must be reached on work content and final manning levels." (49)

In cases of disagreement on manning levels or work content,then "continuous production studies" were to be carried out "to prove the validity of the proposals" (50).

While the practical force that the agreement carried depended greatly upon the kinds of compromises and understandings reached between stewards and industrial engineers in the various sections of the plant,there seems little doubt that these clauses were a significant restraint on the managerial prerogative.Certainly,the contrast between the Longbridge agreement and the general conditions prevailing in the other car producers suggests that the BL stewards had secured an unusually powerful intervention in production.At Ford U.K.,for instance,far from the shop stewards having a voice in the determination of standards and manning levels,they were formally subject to a strict and uncompromising management control.At Ford,every national agreement since 1944 had by the very same wording enjoined the work-force "to achieve production by all reasonable means" (51).Furthermore,shop stewards were denied any right whatsoever to intervene in production at shop-floor level : "It is not part of the duty of any shop steward..to deal with such matters in the shop,but he may refer them for consideration by the Joint Works Committee." (52).

But while the comparison with Ford underlines the powerful influence exerted by BL stewards at this time, the mere fact that their shop-floor power was officially recognized should not be taken as indicating managerial acquiescence.In fact,management viewed the situation with something much less than equanimity,and this was especially the case at the Longbridge plant.There,the impending programme of investment for the AD088/LC8 served to greatly heighten management's concern over shop-steward power in general,and mutuality in particular. In effect,the possibility of the unions exerting a political constraint upon the efficiency and strategic goals served by the new production facilities was unacceptable to management.As early as 1976,BL management identified mutuality as a major impediment to the smooth implementation of the AD088 project.A management report on "The Personnel Aspects of the AD088 programme" commented that ; "Numerous subjects are covered by Mutuality Agreements within the plants which seriously impair the Company's ability to reach its objectives. Longbridge,for example,has such agreements covering Work Content,Manning Levels,Relaxation Allowances and standards - all of which result in protracted negotiation and inefficiency." (53)

Although at this time management were forced,on grounds of expediency,to tolerate some degree of shop-floor power,they had already identified its replacement by a more 'unitary' (54) framework of management control

as an important priority in industrial relations - both for BL as a whole and Longbridge in particular.(For events at Longbridge see the next Section.)

Convergence : industrial relations and efficiency

During the early 1970's the gradual installation of MDW at BL seems to have represented the first phase of a process by which the forces and mechanisms of collective bargaining were slowly but inexorably subordinated to the managerial goals of rationalization and efficiency.This process,which was later carried forward by participation schemes and government intervention,will be termed 'convergence' for it seems to have involved the drawing together of two major functions performed by BL as a business organization.The first such function can be characterized as the economists' view of the firm ; the mechanism for combining the various factors of production into marketable products.The second refers to the role played by the organization as a form of political discipline ; the medium by which the existing social order and the dominant power of capital are imposed upon the workforce.In essence,'convergence' entailed an integration of these normally relatively autonomous functions - such that the political discipline of the workers,via collective bargaining and so on,was merged with the overall conduct of production,and the parameters of political control were fused with the search for greater economic efficiency.In effect,the notion of 'convergence' can be related to the workers' subordination to production as noted earlier (55).

In its essentials,the broad movement of 'convergence' within BL was the result of the firm's increasingly unsatisfactory,indeed almost disastrous,economic performance during the 1970's.As the firm's market share steadily declined,the free play of collective bargaining became more and more confined by the constricting grip of managerial objectives.Both at a company-wide level in the question of government support, and at plant level in management's search for higher productivity,the marketing and production performance of BL came to colour and eventually dominate the conduct of management-union relations.Even given that the processes of management-union bargaining are intrinsically limited by the economic constraints of the enterprise,this close intertwining of economic and political control which took place in BL seems to be largely attributable to the special circumstances faced by the company in this period.Most importantly, the strength of the market pressures demanding rationalization coupled with a financial crisis that encouraged the suppression of labour costs,served to establish the grounds for a radical re-alignment in management-union relations.Further,upon this basis various managerial strategies were developed in the period after Ryder which sought to subordinate the dynamics of collective bargaining to the major economic priorities of,on the one hand,re-organizing the firm,and on the other,extracting considerably higher levels of labour

productivity.

In this perspective,MDW seems to represent the first serious managerial attempt to deal with the productivity problem in BL plants.However,while Lowry's brainchild had some fairly explicit intentions to do with shop-floor power,its main targets were economic in character.In effect,MDW sought the control of labour-costs rather than the political control of the trade unions - as is indicated by the concession of 'mutuality' at Longbridge.The comparatively narrow scope of MDW thus involved the re-adjustment and not the supercession of collective bargaining.

In contrast,the development of participation after Ryder began to articulate far more directly and comprehensively the methods by which management-worker relations might be subordinated to the economic needs of the firm.Indeed the Ryder Report itself explicitly linked the creation of participation to the improvement of BL's productive efficiency,and a reduction in disputes (56).Moreover,the participation arrangements established by Ryder seem to represent the first stage in a process by which management-union negotiations were gradually formulated not as a choice between possible wage settlements,but as a straight choice between survival of the firm and the unions traditional role as wage bargainers.The 'change in attitudes',for example,was to be accomplished by the 'cooptation' of

shop stewards and union leaders.The object of the exercise for management was that stewards should shift their stance away from shop-floor bargaining to a more pastoral role - solving problems rather than organizing conflict (57).As Ryder had explained ; "Workers' representatives need to given more information about their company so that they can better appreciate management's problems and cooperate more constructively in solving those problems." (58) At least one of the "workers' representatives" seems to have accepted the logic of this view,for Frank Chater,a divisional organiser with the AUEW,commented ;

> "Radical changes in workers' attitudes are needed if employee participation within the new BL is to succeed.Participation means that we'll now be involved in decision-making with all the responsibility that brings. Employee representatives will no longer have to answer just to their members.Their actions will also have to be acceptable to the public,who will have a large stake in the reformed corporation." (59)

Ryder's prescription for increasing productivity thus rested upon the acceptance by both union leaders and shop stewards that their role now carried greater 'responsibility' and a greater attention to the needs of the firm.As the planned reductions in manning were to be gradual and linked to a high rate of natural wastage at around seven or eight per cent,Ryder was able to envisage harmonious rather than conflictual industrial relations at BL.Thus,a 'change in attitudes' and cooptation

of the trade unions would replace the discipline of the market-place - which government intervention had softened - with a form of self-control on the part of the workers.

A perfect example of this kind of self-control,in fact,was a joint management-union 'Productivity Sub-Committee' spawned by the participation machinery in March 1976.Here management were able to involve trade unionists in an exercise unequivocally oriented to solving one of the greatest management 'problems'. The terms of reference for the committee read as follows ; "To make recommendations to he Joint Management Council of Leyland Cars on the improvement of all aspects of productivity in Leyland Cars plants, such recommendations being designed for use by Plant Participation Committees." (60) The sub-committee was composed of three BL shop-stewards and four senior managers,and for its investigations visited five different continental plants - Cleon and Flins (Renault), Poissy (Chrysler) and Salzgitter and Wolfsburg (VW) - as well as collecting extensive data from BL's own plants.

The committee's findings,which are detailed in Appendix Two,did much to corroborate management's claims on productivity,and in that sense served to reinforce the remedial actions which management were planning.The committee's report offered a detailed analysis of BL's productivity deficiencies,culminating in the following table.

TABLE TWO

Production shortfall : BL versus Volkswagen

Powertrain		Body+Assembly		
VW:10,000	BL:10,000	VW:10,000	BL:10,000	
	-700		-600	:Looser work standards.
	-950		-2000	:Allowed non-productive time.
	-1000		-1750	:Excess non-productive time.
	-1000		-1000	:Disputes.
	-750		-750	:Greater relaxation allowance.
	+400		+400	:Shorter holidays.
VW:10,000	BL: 6,000	VW:10,000	BL: 4,300	

Source : BL Productivity Sub-Committee (61).

The table indicates the various reasons why,with the same manning levels,BL could only produce some 6,000 units of Powertrain and 4,300 of Body+Assembly against Volkswagen's total of 10,000 units of each.This dramatic lack of competitiveness clearly had a great deal to do with industrial relations issues,centring on management's ability to control and deploy the manual labour-force ; notably in the area of work standards and 'excess non productive time'.

a) Productivity crisis and rationalization

The Productivity Sub-Committee was only one of the many devices employed by management in order to involve the unions in some form of self-discipline, helping to impress the economic needs of the firm upon the process of collective bargaining.By the end of 1977,however,it had become apparent that these mechanisms of participation had succeeded neither in securing trade union quiescence,nor in elevating the levels of productivity within the firm.The arrival of Sir Michael Edwardes effectively meant the end of participation in BL,as well as the Ryder strategy of which it was a part.Henceforward,the integration of the economic functions of the firm with the political discipline of the work-force was to be achieved not by some artificial structure of cooptation,but by means of the process of rationalization itself.

Under Edwardes it soon became clear (62) that management no longer flinched from the uncompromising assault on union power which the firm's strategic goals implied.Unlike Ryder who sought to accomodate structural change within a harmonious management-union relationship,Edwardes and his team (63) aimed to overturn that relationship by employing redundancies and plant closures as a political bludgeon against the trade unions.The success of this strategy can be gauged from Table Three which indicates the increasing quiescence of the unions in face of the massive programme of

'de-manning' undertaken by the Edwardes management.

TABLE THREE

	Dec.'77	Dec.'78	Dec.'79	Dec.'80	Nov.'81
BL : Total U.K. employees.	176	164	146	118	96
Reduction in year.		12	18	28	22
Man-hours lost through internal disputes, p.a. (millions)	14.8	10.0	4.8*	3.5	0.9

*Excluding man-hours lost in CSEU strike affecting all engineering workers.

BL Manpower (000s) and man-hours lost, 1977-81

Source : BL 1982 Corporate Plan (64)

Along with the programme of rationalization went a number of managerial initiatives aimed at securing a more orderly and controlled system of industrial relations. At the end of 1978, for example, BL management outlined proposals for completing the work done by MDW and achieving a completely centralized and standardized system of wage bargaining within BL. Their aim was to replace the existing fragmented 'merry-go-round' (65) of the bargaining process with a centralized system in which wage-rates for all plants would be determined by a corporate job-grading arrangement.

However,although the proposals were in many ways simply a sequel to MDW,the manner in which they were introduced - that is to say,imposed unilaterally against union resistance - demonstrated the new,unyielding and unsympathetic face of management.Further,the centralization of bargaining,which took place from July 1979, was clearly designed to serve as the spade-work for improvements in productivity at plant-level.The new management approach was later encapsulated by Sir Michael Edwardes in the following terms : "As the environment gets even tougher so we must make even more inroads on some established attitudes..those attitudes that don't match up to those of our major competitors." (66)

Behind the rhetoric of 'changing attitudes' lay a determination to achieve significant gains in labour productivity at plant-level,involving,in the first instance the dismantling of the shop-floor power exerted by trade unions.Nowhere was this intention better revealed than in management's dismissal of Derek Robinson,the Longbridge convenor,on the 19th November 1979.Robinson was summarily dismissed on that date,supposedly for his opposition to Edwardes' plans,but in all probability as the first victim of what Edwardes himself called "an uncompromising stance against militants" (67).Or,as Robinson saw it,"a clear-cut intention to bring about an atmosphere of fear and intimidation,to bring about an uneasiness amongst the average shop steward as to

what his job prospects will be if he dares to oppose company policy" (68).Whatever the reasons behind Robinson's dismissal - and there is some suggestion that they were connected with the Metro project itself (69) - it seems clear that it formed part of a general management strategy of humbling trade union power in BL plants.Only when the power of shop-stewards had been eliminated could management begin to install the new standards of efficiency and work practices which were deemed strategically necessary for the firm's survival.

However,this could not be a matter for plant-level action alone,especially in view of the wide extent of management's aims - the dismissal of Robinson might intimidate Longbridge stewards but could only have comparatively little effect elsewhere.In consequence, much of senior management's attention was focussed on the task of securing the acquiescence of national union officials in their plans.Not only did this approach allow them to exploit the many divisions in the trade union front - between the right-wing AUEW and the left-wing T+G.W.U.,and between national officials and shop-stewards - but it also allowed them to capitalize upon those officials who,as Beynon describes,were "convinced of the need to Fordise and rationalise British Leyland" (70).

But perhaps the most important element in management's repertoire at this time was the crude but effective

use of intimidation.This was not simply a matter of dismissing a single shop-steward,but rather the use of management's ultimate veto ; the threat to liquidate BL as a whole.This threat was implicit in the Ryder Plan insofar as government finance was to be contingent on BL's industrial relations record.However,it was under Edwardes that this threat was most explicitly and extensively used against the unions.In October 1979,for example,the national union leaderships were cajoled into accepting the 'Edwardes Plan' by the threat of closure.Then in November 1979,in coming forward with a major set of proposals on work practices and standards,senior management stressed the gravity of the firm's situation : "We have deliberately put all our cards on the table and have told you frankly where we stand and what we can afford.We are not playing negotiating games with you..We cannot afford the time for protracted discussions or for inconclusive debate." (71)

This kind of blunt,intimidatory tone became a consistent feature of the negotiations between management and unions.When the unions threatened a strike over management's November proposals - the so-called 'Draft Agreement' (72) - Ray Horrocks,the Managing Director of Austin-Morris intoned ; "Austin-Morris cannot face an extended strike at Longbridge over this or any other issue.A decision to strike is likely to determine the future of Austin-Morris as a

whole." (73) Ultimately,so great was the pressure from management,national union leaders were coerced into submission.Moss Evans,the leader of the T+G.W.U.,intervened to prevent a major strike over the issue,because he was "convinced by documents shown to him by BL that there was no more money available and that there was no point in asking the government for more aid" (74).

Management's victory in this the last major management-union confrontation before the launch of the Metro is ample evidence of the strength of their bargaining position at this time.Ironically,their hand had in some ways been strengthened by the very precarious position in which BL now found itself after years of market decline.Government support for the firm,being contingent on industrial relations performance,placed Edwardes and the BL Board in a unique bargaining position.They could manipulate the exigencies of the market to their own political ends,using the closure of the firm as a threat,a final veto to be proffered or withdrawn according to circumstances.Yet,no private enterprise board would have been able to do this - if only because of the possible repercussions on share price.

It would be wrong,however,to simply see these events as evidence of management ruthlessness or political acumen.Behind the power ploys of management lay a very serious and strategic purpose - to increase labour productivity substantially by sweeping away the political

constraints upon management's control of the labour-force.As the Productivity Sub-Committee's report had indicated,productivity levels in BL were grossly inefficient compared to continental rivals.and this, in management eyes,constituted a crucial threat to the firm's survival.In the negotiations of November 1979,for example,senior management explained the case for major changes in work practices as follows :

> "It must be generally recognised that the Company is at a critical point in its fortunes and that if we do not take drastic action immediately to achieve competitive levels of productivity we shall be accelerating the process of decline." (75)

Hence,trade union job controls had to be abolished because there was a "desperate need to use all our facilities and that means freedom from industrial action,from restrictive practices and from all the other constraints that prevent us getting maximum use of the full working shift on all our plant,equipment and facilities" (76).

Management's detailed plans for the changes it sought were contained in the 'Draft Agreement',which is discussed at greater length in the following section of the thesis.In essence,however,this 'package' of changes promised to bring about the virtual elimination of the kinds of job controls and custom and practice which had accumulated in BL plants over the previous thirty years.The very fact that management found it necessary to enter into such direct confrontation with the

trade unions serves to indicate the size of the task that they were undertaking.

But the most detailed evidence of the scope of management's intentions comes from BL's 1980 Corporate Plan, which was drawn up at around the same time as management were making their 'Draft Agreement' proposals. As Table Four indicates, management's strategy in the 1980 Plan was directed towards further substantial reductions in the work-force. These were to serve as the first step in achieving a huge increase in BL's levels of labour productivity - with manning levels falling prior to the expansion of production to 882,000 cars per annum by 1985.

TABLE FOUR

Manning levels (000s):	1979	1980	1981	1982	1983	1984	1985
Austin-Morris :	42.6	39.6	34.5	34.4			
P.S.F.* :	24.8	21.1	18.5	17.8			
J.R.T.** :	36.9	32.2	26.8	25.5			
Total (car divisions)	104	93	80	78			
Worldwide sales (000s)							
Austin-Morris :	461	407	449	464	523	608	643
J.R.T. :	158	166	132	123	129	128	140
Land Rover :	63	72	77	85	90	97	100
Total BL Cars	682	645	659	672	742	833	882

BL Cars : Sales Forecasts and Manning Levels

*Pressed Steel Fisher, **Jaguar Rover Triumph
Source : BL Corporate Plan, 1980 (77)

The reduction in the labour-force of BL's car making divisions was to presage the expansion of production from 1981 onwards, such that, given 1982 manning levels, productivity in the Austin-Morris division would be increased by 58% to 1985. Indeed it seems evident that for certain key plants - especially Longbridge - an even greater increase in productivity was sought. One informed estimate (78) suggested that BL management were looking for a 100% increase in productivity at Longbridge between 1980 and 1981.

These figures serve to locate the strategic context in which the Metro facilities were brought into production in 1980. Behind management's efforts to eradicate shop-floor power by means of the Draft Agreement (as described in the following section), lay the overriding goals of increasing the plant's efficiency and productivity in line with the strategy detailed in the 1980 Plan. In this perspective, the installation of new technologies was closely linked to management's strategic objectives for the plant and the general re-arrangement of technical and social relations which they implied.

Conclusion

With victories first over the dismissal of Derek Robinson and then over the Draft Agreement, by October 1980 (launch-date for the Metro) BL management had succeeded in bringing about an almost revolutionary change

in the firm's system of industrial relations.The 'convergence' of economic and political controls had greatly intensified the subordination of collective bargaining to the priorities established by management's corporate planning.Moreover,at shop-floor level managerial authority had been boosted to a level unknown for twenty years or more.Wage costs had been effectively suppressed for the previous three years,and the frequency and length of internal disputes had fallen dramatically.

Yet,for all this managerial success,the overall record of labour productivity at BL plants shows little substantial improvement.Despite,management's efforts to secure what we termed 'labour's subordination to production',there was actually a decrease in labour productivity from 1979 to 1980.As the House of Commons Industry and Trade Committee discovered,in 1979 BL achieved 5.2 vehicles per man but by 1980 this had fallen to 5.0 vehicles per man (79).It seems clear from this that the subordination of the labour-force,no matter how complete,could not of itself,or automatically, increase BL's productive efficiency.Not only did that require investment in new production facilities,but it also demanded (as the Metro case-study shows) flexible and skilled labour to operate those facilities.

Most important of all,however,just as flexibility cannot be instilled by intimidation,equally market demand cannot be conjured up simply at management's behest.Notwithstanding Edwardes'programmes of de-manning,

the reductions in BL's labour-force had barely kept pace with the decline in the firm's market-share.Inasmuch as market demand determines the scale and short-term efficiencies of production,this was bound to have a deleterious effect on productivity.As the Industry and Trade Committee noted ; "BL's productivity in 1980 was badly affected by falling demand for cars and trucks.Manpower was reduced..with a fall in BL Cars of 23,600 and in LVL (Leyland Vehicles) of 1,900 people.Even this,however,was not enough to help keep pace with the fall in demand." (80)

After the market stagnation of the late 1970's, the intense competition of the 1980's meant that for a firm such as BL the struggle for market-share became more than a fight for profitability,but rather a battle for survival.Even given improvements in labour productivity,unless BL could secure a worthwhile share of the market it seemed doomed to an ever more hopeless struggle against collapse.Without a large-scale market BL could not secure economies of scale and high productivity,and without these it was bound to become more uncompetitive,see its market-share decline further,become even more uncompetitive,and so on.

Consequently,by the end of 1980 it seemed evident that BL could only begin to secure a comprehensive and consistent improvement in productive efficiency if it managed to achieve a substantially greater share of the

market.The importance of productivity tout court to this kind of overall improvement would seem - bearing in mind the Eurofinance comments noted earlier - to have been secondary to the success or failure of the firm's product and partnership strategies.

In the final analysis then,the survival of BL Cars seems to have depended as much upon the effectiveness of managerial strategy,as upon the issues of productivity and efficiency to which management themselves gave such emphasis.If these strategies were to fail - if the Metro or the LC10 were unsuccessful in the market-place say - the 'logical' conclusion of the many years of rationalization would be the firm's liquidation.In Sir Michael Edwardes' words : "The BL Board is prepared - and may one day be forced - to take unpalatable decisions affecting the whole of the company if circumstances require it.But this is a logical last resort..." (81)