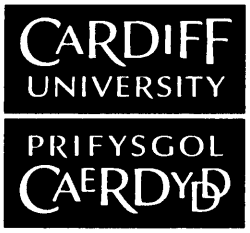
A Role for International Vertical Joint Ventures Within An Automobile Industry Paradigm

A case study of MG Rover in comparison with the global automobile industry



A thesis submitted for the Degree of Doctor of Philosophy
Cardiff University

by

Michael S Wynn-Williams

Cardiff Business School
Cardiff University

October 2007

Abstract

This research puts forward a conceptual framework for automobile companies by constructing an automobile industry paradigm. The precepts of the paradigm are based upon investigations of transaction costs and economies of scale. This results in a full-function model of vertical integration for an automobile firm operating with prescribed levels of production output. The research then uses historical case studies and empirical data to look at the extent to which automobile companies are competitive within the paradigm, particular reference being made to the main case study company, MG Rover. Contextual empirical data was gathered using semi-structured elite interview techniques conducted with senior executives throughout the automobile industry in the UK and Japan. Through survivor analysis and investigation of leading plant sizes the research found that although there is a minimum efficient scale (MES) for a company, this being the prototypical automobile firm with optimal output MES_P, there are additional advantages to be gained from output expansion. Conversely, firms that are wholly uncompetitive can replicate the prototypical model by exploiting divisibilities due to differences between human and capital assets as well as international factor endowment differentiation. The organisational structure for achieving this is the international vertical joint venture (IVJV). There is evidence to suggest that MG Rover was moving towards this type of structure but was precluded from doing so due to its financial collapse in April 2005. Since then, the purchasers of MG Rover's assets, SAIC and NAC of China, have separately continued with variations of the IVJV structure in order to approximate to the requirements of the automobile industry paradigm.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.....(candidate)

Date....30th November 2007

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed.....(candidate)

Date....30th November 2007

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed.....(candidate)

Date....30th November 2007

Acknowledgements

This is my third thesis for this PhD. My first thesis was as magnificent and tragic as the Titanic, the second as industrious as a cross-Channel ferry. For this thesis, the last of the line, I hope I have imbued it with the strength of an ice-breaker and the grace of a schooner: it certainly feels as heavy as a battleship.

I was fortunate to gain funding from the EPSRC, which included several trips to Japan, and I hope the organisation finds value in their investment. I was later sponsored by Trend Tracker Ltd, with thanks to Chris Oakham. In conducting the research I would like to thank everyone who allowed me to interrogate them. All interviewees gave their time freely and I have nothing but fond memories of the fieldwork. At Cardiff Business School, Dr Paul Nieuwenhuis assisted with the automotive related material and can be said to be the Father of the Budd Paradigm upon which this research is based. Professor Garel Rhys was inspirational and had a far greater impact on the research than the brevity of his advice might suggest. My examiners were Professor Max Munday and Dr David Bailey, who were generous in their mercy but firm in their expectations. Toiling away in the background were Elsie Phillips and Laine Clayton, whose quiet efficiency and ready sympathy was not unnoticed. Most of all, I am grateful to Professor Trevor Boyns who supervised beyond-the-call-of-duty and without whose tireless goading this thesis would never have attained the standard that it did.

Throughout this six-year sentence of penal servitude in the cause of automotive research I have been sustained by a host of people, many of whom will not be aware of the support they have given me. It was Bethan Roberts who first suggested this course in my life, perhaps in a moment of idle jest, and Dr Chris Nightingale, who put my application into a credible form. In the second year of the research, when my morale hit rock bottom, the arrival of Jyoti Butel (cheers mate!) and Stefan Lång raised my spirits high enough to give me the energy to persevere. My parents were unstinting in their support, as were my godfather and his wife, Derek and Sheila Watson. Somewhere in the background there was always Roger Waters, though my admiration for him is probably the safer for having never met him. There are also those who have fallen on the way, such as Rhossili, Micra and Fiesta; they were little troopers to the end. Ultimately, though, there is one who has stuck by me over the past decade with a project of her own: me. Well, Kerry Ann Kludsikofsky, you have passed.

Contents

Section	Title	Page
1:	**Introduction**	**1**
1.1	Growth of a global industry	1
1.2	Defining the automobile industry paradigm	5
2:	**Methodology**	**14**
2.1	**The role of research questions**	**15**
2.1.1	Scope of investigative methods	15
2.1.2	Qualitative and quantitative research designs	20
2.2	**Case study design**	**22**
2.2.1	Critical perspectives	22
2.2.2	Defining the case study as a research strategy	23
2.2.3	Kuhn and paradigm revolutions	25
2.2.4	Case Studies as paradigm and methodology	27
2.2.5	Types of case study	28
2.2.6	Stake and collective case studies	29
2.2.7	Yin and the matrix	29
2.3	**Data collection**	**32**
2.3.1	Elite interviews	33
2.3.2	Linking of interviews – by content	37
2.3.3	Linking of interviews – by respondent	39
2.3.4	Data recording and coding	42
2.4	**Validity, reliability and generalisability**	**44**
2.4.1	Reliability	44
2.4.2	Internal validity	45
2.4.3	External validity and generalisability	46
2.5	**Ethical concerns**	**48**
2.6	**Foundation for research design**	**51**
3:	**Research Design**	**53**
3.1	**Qualitative case study**	**53**
3.2	**Selection of the case study company**	**55**

3.3	**Company access**	**58**
3.3.1	Case study access – MG Rover	58
3.3.2	Contextual industry access	59
3.3.3	Access hold-ups	61
3.4	**Other documented information**	**62**
3.5	**Triangulation**	**63**
3.5.1	Literary and empirical source triangulation	65
3.5.2	Interview triangulation	66
3.5.3	Interview frequency	69
3.6	**Ethics**	**71**
3.7	**Initial phase**	**73**
3.7.1	Morgan Motor Company – an introduction to fieldwork	73
3.7.2	Trade union perspective	74
3.7.3	International motor shows	75
3.8	**Main interviews**	**77**
3.8.1	MG Rover	77
3.8.2	Contextual industry	78
3.9	**Recording and coding**	**80**
3.9.1	Recording	80
3.9.2	Coding	81
3.10	**Conclusion**	**83**
4:	**Considerations of Scale**	**85**
4.1	**Economies of size**	**86**
4.1.1	Economies of scale	87
4.1.2	Economies of scope	90
4.2	**Production costs**	**93**
4.2.1	Short-run costs	94
4.2.2	Long-run costs	96
4.2.3	Alternative long-run average cost curves	100
4.2.4	Integrating different production processes	101
4.2.5	Cost curves for the multi-plant firm	103
4.2.6	Survivor analysis	106

4.3	**Economies of scale in the automobile industry**	**111**
4.3.1	Survivor analysis in the automobile industry	113
4.3.2	Body construction	123
4.3.2.1	The Budd Paradigm	124
4.3.2.2	Economies of scale in body pressings	126
4.3.3	Powertrain	129
4.3.4	Final assembly	132
4.3.4.1	Final assembly economies of scale	133
4.3.5	Research and development: economies of scale and scope	136
4.3.5.1	Vehicle research and development	139
4.4	**Combining the LAC curves**	**145**
4.5	**Conclusion**	**152**
5:	**Structuring the Automobile Industry Paradigm**	**153**
	Part I: Company Structure	**154**
5.1	**Vertical integration and the full-function company**	**155**
5.1.1	Component supply industry and functional relationships	157
5.1.2	Transactions as mechanical friction	158
5.1.3	Contracts and the market	161
5.1.4	The imperfect contract	163
5.1.5	Specificity	165
5.1.6	Site asset specificity	166
5.1.7	Physical asset specificity	168
5.1.8	Human asset specificity	169
5.1.9	Unitary and multidivisional governance structures	172
	Part II: Constructing the Automobile Industry Paradigm	**185**
5.2	**Constructing the automobile industry paradigm**	**186**
5.2.1	Paradigmatic view of the automobile industry	189
5.2.2	Vertical integration of the automobile paradigm	192
5.2.3	Defining the functions	194
5.2.4	Integration with powertrain	197
5.2.5	Integrating body production – the case of GM and Fisher Body	198
5.2.6	Integration with design	204
5.3	**Resultant size and shape**	**208**

5.4	**Empirical evidence of vertical integration**	**211**
5.4.1	Vertical integration – contextual sources	212
5.4.2	Vertical integration – MG Rover	220
5.5	**Conclusion**	**224**
6:	**Approximating to the Automobile Industry Paradigm**	**227**
6.1	**Introduction**	**228**
6.1.1	Sub-scale production	230
6.2	**Internal approximations to the automobile paradigm**	**233**
6.2.1	Extending use of the production system	233
6.2.2	Economies of scope and scale in flexible production	234
6.3	**External approximations to the automobile paradigm**	**238**
6.3.1	Hybrid organisational structure	240
6.3.2	Co-operative organisation structure	241
6.3.3	Human assets in link alliances	246
6.4	**Opportunities raised by globalisation**	**250**
6.4.1	Globalisation of trade	252
6.4.2	Critics of globalisation	254
6.4.3	Foreign direct investment	257
6.4.4	Dynamic theories of FDI	260
6.4.5	The eclectic paradigm	265
6.4.6	Strategic FDI	269
6.4.7	Ford: a failure of global structure	273
6.5	**Reassessing the full-function structure**	**277**
6.5.1	Vertical joint venture at GM	278
6.5.2	Human assets and the full-function model	281
6.5.3	International vertical joint venture: Rootes Group	282
6.6	**Conclusion**	**286**
7:	**A Sustainable Model for MG Rover**	**288**
	Part I: The Contextual Automobile Industry	**291**
7.1	**Internal approximations to the automobile industry paradigm**	**291**
7.2	**Structure and opportunities of globalisation – Institutions**	**294**
7.3	**Globalisation and the contextual automobile industry**	**297**

7.4	**Collaboration**	**302**
7.5	**Conclusion – adaptation to the automobile industry paradigm by contextual companies**	**305**
	Part II: MG Rover	**307**
7.6	**The rise and fall of British Leyland/Rover Group**	**307**
7.6.1	The consolidation of MG and Rover	307
7.6.2	Internal rescue strategies – 1975 to 1978	309
7.6.3	External rescue strategy – link and scale alliances	312
7.6.4	BAe purchases Rover Group	321
7.6.5	External assistance for internal improvement – BMW	324
7.7	**MG Rover – autonomy and sustainability**	**328**
7.7.1	MG Rover internal approximations – literary sources	329
7.7.2	MG Rover internal approximations – contemporary views	331
7.7.3	MG Rover and globalisation – empirical data	332
7.7.4	MG Rover globalisation and industry – empirical data	332
7.7.5	Collaboration – MG Rover literary sources	336
7.7.6	Collaboration – MG Rover empirical data	343
7.8	**MG Rover assets – reconstructing the international vertical joint venture**	**350**
7.9	**Conclusion**	**356**
8:	**Conclusions**	**359**
8.1	**Current state of the industry**	**360**
8.2	**Paradigm revolution for the automobile industry**	**363**
8.3	**Implications for national policy**	**366**
8.4	**Applicability to other industries**	**367**
8.5	**Suggestions for subsequent research**	**370**
8.5	**Closing remarks**	**371**
	References	**372**

Appendix 1 **396**

Appendix 2 **399**

Appendix 3 **404**

Appendix 4 **405**

Appendix 5 **406**

Appendix 6 **407**

Appendix 7 **409**

Appendix 8 **410**

Appendix 9 **413**

Appendix 10 **415**

Appendix 11 **417**

Appendix 12 **418**

Appendix 13 **419**

Appendix 14 **420**

List of Figures

Figure	Title	Page
1.1	Fundamental arguments to the automobile industry paradigm	6
2.1	Basic types of case study	31
3.1	Frequency of interviews	69
4.1	Fixed cost, variable cost and total cost in the short-run	94
4.2	Plant cost in the short-run	95
4.3	Alternative plant sizes for long-run planning	97
4.4	Marginal cost in the long and short-run	99
4.5	Alternative LAC curves	101
4.6	Matching machine outputs	102
4.7	LAC for two plants	105
4.8	Total global production, 1975-2005	115
4.9	Global production share of seven output ranges	116
4.10	Global production share of five output ranges	118
4.11	Production share for the industry leaders, 1975-2005	119
4.12	Global production output for top 5 manufacturers, 1975-2005	120
4.13	Theoretical economies of scale for panel stamping	126
4.14	Economies of scale for BIW production	129
4.15	Economies of scale for powertrain production	132
4.16	Economies of scale for final assembly	135
4.17	LAC curve for R&D, various industries	138
4.18	Economies of scale for R&D	144
4.19	LAC curves for a prototypical integrated car firm	146
4.20	Automobile company exploiting acceptable economies of scale	147
4.21	SATC curve for a prototypical integrated automobile firm	148
4.22	SATC and LAC curves for automobile industry firms	151
5.1	Typical full-function producer	156
5.2	U-Form functional governance structure	173
5.3	M-Form multidivisional governance structure	176
5.4	Hybrid U-Form and M-Form governance structures	182
5.5	Typical full-function automobile producer	193
5.6	Full-function model quantified	208
5.7	Automobile industry paradigm	210
6.1	Pre-global trade	253
6.2	Direction of trade 1997 – inter-triad and intra-triad trade movement proportions	255
6.3	Vertical joint venture between A O Smith and GM	280
6.4	Vertical joint venture between Rootes Group and Iran Khodro: Iranian standpoint, 1993	284

7.1	Honda and BL joint venture 1981 – Triumph Acclaim	316
7.2	Honda and BL link and scale alliance 1987 – Project XX	318
7.3	Proposed IVJV between MG Rover and SAIC	342
7.4	IVJV style relationship between Ricardo 2010 R&D and SAIC	354
8.1	Automobile production output and forecast 2000-2020	363
8.2	Proposed IVJV between Harland and Wolff and a shipbuilding company	369

List of Tables

Table	Title	Page
1.1	Automobile producing countries, 2006	3
2.1	Applications of research strategies	16
3.1	Range of potential alternative cases to MG Rover	56
3.2	Contextual interview categories	62
4.1	Four major automobile functions	112
4.2	Development of MES in the automobile industry	113
4.3	Top thirteen automobile producing nations	114
4.4	Top twenty manufacturers, 2005	122
4.5	Typical Budd plant investment	125
4.6	Japanese powertrain capacity in the US 2004	131
4.7	Japanese assembly operations in the US 2004	133
4.8	Global R&D Expenditure 2005/6	140
4.9	R&D expenditure per model	142
5.1	Honda – areas of control and derived benefits	212
5.2	Honda – functional integration and its impact	215
5.3	Automobile companies and dependency/autonomy	217
5.4	Divisional control of operations and strategy	219
5.5	MG Rover – theoretical and practical considerations of autonomy	221
6.1	Plant site selection criteria	268
7.1	Institutions of globalisation – effectiveness	295
7.2	Institutions of globalisation – effect on Honda	296
7.3	Global automobile industry and levels of international integration	298
7.4	Domestic and global structures of Honda	299
7.5	Degrees of product adaptation to overseas markets	300
7.6	Honda – Impact of joint ventures	304
7.7	Honda and BL comparison	314
7.8	Honda-Rover alliance – BL/Rover share of vehicle programmes	317
7.9	Rover plant utilisation – 1987	322
7.10	Rover Group's share of UK market	327
7.11	Rover Group financial losses	327
7.12	Longbridge production output 1999-2004	330
7.13	Elements of global industry – strengths and weaknesses	333
7.14	MG Rover- market characteristics and strategic responses	334
7.15	Differentiation of global resources	335
7.16	MG Rover R&D expenditure, 2003-5	340
7.17	Global R&D expenditure 2003/4	341

7.18 MG Rover R&D productivity 341
7.19 MG Rover – search for a partner 344
7.20 MG Rover – Impact of joint ventures 347

1: Introduction

The global automotive industry is a valid area of research since it unquestionably continues to have a substantial influence on the world's economy. Despite this, its future trajectory is not well understood. This researcher has always been an enthusiastic spectator of the industry and much of this research therefore springs out of a personal quest to understand the most fundamental forces that structure the industry. It was a particular advantage that the researcher already had a substantial, if amateur, knowledge of the industry and a close interest in its fortunes. The project was begun as an attempt to demonstrate that diversity and independence had a place in the globalisation of the industry. In the initial phase of the research the focus was directed towards the survival of the UK's one remaining and independent mass market car manufacturer, MG Rover. The hope was to reveal some strategy by which the company could sustain itself in defiance of prevailing opinion. As both the research and the company's fortunes developed the focus was widened to include any automobile firm that was considered to be of a type that would be vulnerable to the vicissitudes of the industry.

1.1 Growth of a global industry

The world's automotive industry has long played an important economic role. It is now one of the largest industries in the world but even in 1946 its size prompted Peter Drucker to declare:

"...the automobile industry stands for industry all over the globe. It is to the twentieth century what the Lancashire cotton mills were to the early nineteenth century: the industry of industries" (Drucker, 1972, p.176).

Over thirty years later, in 1981, the managing director of Volvo, Pehr G Gyllenhammar, stated:

"I personally believe that the automobile industry marks the limit of the sustainability of industrial society. If you, as a country or a nation, state as a fact that you are not

competitive within this industry, then you have also abdicated from industrial society" (Malmberg, 1991, p.212).

Data from the International Organisation of Motor Vehicles Manufacturers (OICA) shows that the impact of the industry has not softened since then. In 2005, total vehicle production reached 66m units (46m of which were cars), an increase of 3.1% over 2004 when employment had reached 8.4m in vehicle production and the related component industries. OICA estimates that as much as five times as many more people are employed indirectly, resulting in total employment of around 50m. This makes a substantial contribution to the global economies, equivalent to turnover of €1.9 trillion, making possible investments in research and development (R&D) and production of around €85bn. Governments too, benefit, the 26 OICA member countries collecting €430bn in revenues.

The greater part of the automotive industry is made up of automobile production, amounting to around 50m units in 2006 (ACEA, 2007). Production output is not distributed evenly around the world, Western Europe taking the larger share at 33% of the total. Within the European Union (EU) there has been some shift in production towards the newest member countries so that Romania, Slovenia and the Czech Republic have gained production while only Germany of the established European countries has also continued to grow (OICA, 2006a). In sum, total production for the European region has remained fairly steady.

Elsewhere in the world shifts in general automotive production have been detected. In 2006 automotive vehicle production in North America fell by 2.7% while Africa grew by 16.3%, although nearly half of these vehicles were trucks. African output was dominated by South Africa which manufactured nearly 340,000 automobiles, out of a total of 458,000 for the continent as a whole. The Asia-Pacific region showed growth of 9.3% in total automotive output, China being conspicuous with general automotive industry growth of 26.3% and automobile output of 4.3m units. Despite that rate of increase Japan remains the biggest producer in the region with 9.8m automobiles produced, a rise of 8.2% on the year before (JAMA, 2007). Table 1.1 below shows the countries producing over a million units a year.

Table 1.1 Automobile producing countries, 2006

Country	Automobile Production Output (millions)
Japan	9.8
Germany	5.4
United States	4.4
China	4.3
South Korea	3.5
France	2.7
Brazil	2.1
Spain	2.1
India	1.4
UK	1.4
Canada	1.4
Mexico	1.3
Russia	1.2

Source: Automotive News, 2007a

Table 1.1 shows that although emerging economies such as China occupy strong positions in the global automobile industry, other countries that have long historical links to the industry continue to be strong players. It is necessary, therefore, to distinguish between the general automotive industry and the specific characteristics of the automobile industry. Historically, all vehicles could be made using similar methods, an unstressed body being attached to a load bearing platform, or chassis. Automobile manufacturing took on a distinct form of production technology when the all-steel load bearing unitary body was developed in the early part of the 20th Century. This manufacturing process is highly restrictive, both in the form of the final product and in the method of production, so it is best suited to automobiles which have a well-defined purpose i.e. the comfortable and affordable transport of small groups of passengers at their own convenience. Nieuwenhuis and Wells (1997; 2007) have termed the body manufacturing process the Budd Paradigm after the originator and it is the economies of scale here that set those economies of scale for the automobile industry as a whole.

These large economies of scale create high entry barriers in the industry which result in the incumbents retaining the advantage and high exit barriers which keep the incumbents in place (Altshuler *et al.*, 1986). For example, as the Chinese automotive industry has begun to rise it has required substantial assistance from the government in order to elevate indigenous manufacturers to a level where they could compete against the established, global competition. The government has done this by obliging foreign manufacturers to enter into joint ventures (JVs) with local firms as a mechanism for transferring technical capability and equalising output between local and foreign firms. Chief amongst these JVs is that between VW and SAIC, which sold 694,406 units in 2006 (Automotive News, 2007b). However, domestic Chinese manufacturers that are not in JVs with overseas manufacturers still had difficulty entering the local automotive industry and accounted for just 27% of the Chinese market in 2006, this being spread over 20 different manufacturers (Business Week, 2007). Even Chery, the largest independent Chinese manufacturer with 7.2% of the market, has joint ventures with Fiat and Chrysler along with substantial engineering consultancy input from Lotus of the UK and AVL of Austria (Chery, 2007; Automotive News, 2007b)

There is no sign that entry barriers to the industry are coming down. New technological challenges for the industry, particularly with regard to safety and exhaust emissions, have meant that product development costs have risen. Bailey (2007) gives a range between £400m and £1bn for bringing a complete new model programme to the market:

"As a result, large scale production over different brands using a platform-sharing approach is vital to generate the cash for future model development." (Bailey, 2007, p.139)

The established manufacturers therefore enjoy advantages in size that enable them to spread the costs of product development over a greater number of units in addition to accessing economies of scale in production. This has led to a trend towards higher outputs and consolidation as major manufacturers merge to form larger groups. Maxton and Wormald (1985) predicted that only five global automakers would eventually survive, two in the US and three in Japan. Ford is a case in point, acquiring

Jaguar (1989), Aston Martin (1994), Volvo (1999) and Land Rover (2000) to form the Premier Automotive Group (PAG) division. There have been similar mergers throughout the industry, such as Daimler and Chrysler (1998), Renault and Nissan (1999) and BMW and Rover Group (1994).

However, this appears to have been the peak of the merger activity and since 2000, of those listed, only the Renault-Nissan relationship has remained intact. PricewaterhouseCoopers (2005) found that by 2004 the value of mergers between automotive manufacturers had fallen to $2.3bn, which was 9% by value of the total merger activity in the global automotive industry and down from 29% in 2002. A later annual survey by KPMG (2007) found that while larger firms would continue to hold the advantage consolidation would no longer be achieved through full bilateral mergers but by strategic alliances. This suggested that firms would be able to access economies of scale but retain their own organisational structures. In 2005 Automotive News (2005j) counted 21 independent automobile manufacturers that were also operating in partnerships and in 2006 the publication listed 42 automobile manufacturers with output ranging from 14,000 a year (Hindustan Motors) to 9m (Toyota) (Automotive News, 2007). This is not to negate the pressure for companies to consolidate into groups but it does suggest that the theories concerning consolidation need further articulation. The Economist (2005) particularly noted that Toyota had come to prominence achieving economies of scale while largely retaining the same integrated organisational structure.

1.2 Defining the automobile industry paradigm

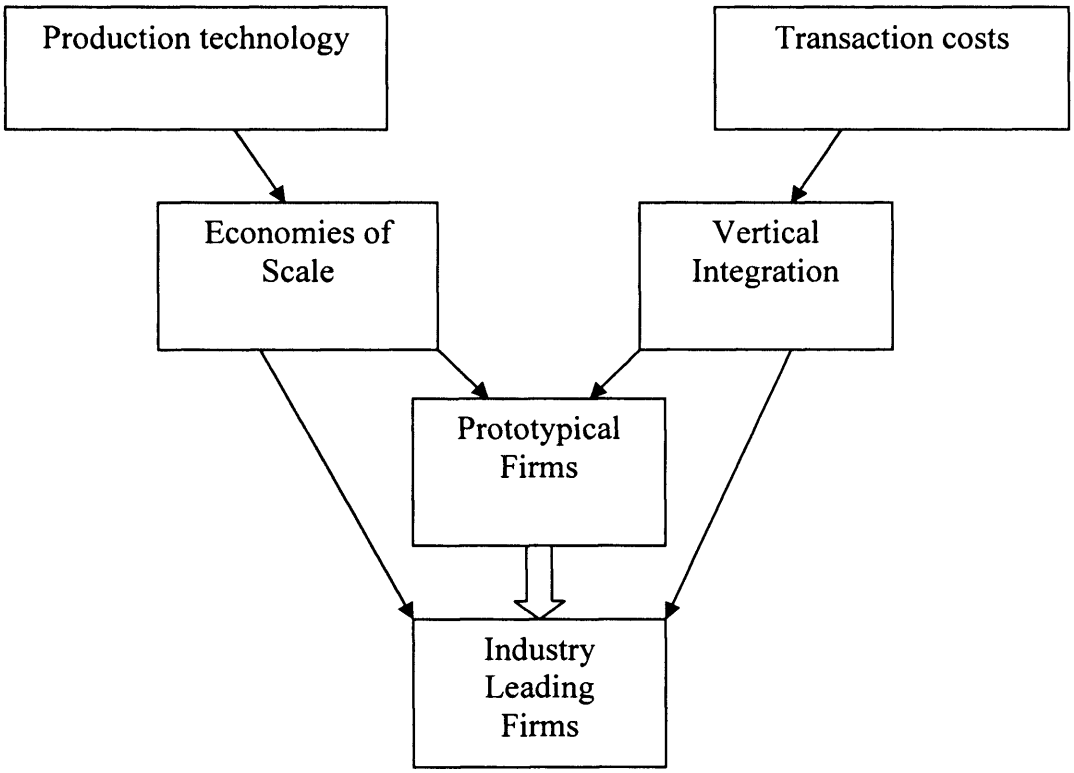
Received wisdom has contended that due to economies of scale in the industry there is an irresistible trend towards consolidation such that smaller manufacturers would either have to join together or else leave the industry. Yet this convergence on a few dominant manufacturing groups has not been found to be inevitable and there have been instances in other industries where firms have exploited economies of scale through a network of alliances that maintained their independence, Scania offering one such instance in the commercial vehicle industry. Furthermore, some recently formed large groups have subsequently demerged, DaimlerChrysler being notable here. If it could have been shown that MG Rover had the potential to be an exception

to the behemoths of industry then it would have given hope for diversity and independence, not only in the automobile industry but also in other industries. Although ultimately this hope was proven to be forlorn in the case of MG Rover as an independent automobile manufacturer, the research does find that a novel form of international alliance could, perhaps, have sustained MG Rover as a developer of new models on behalf of a dedicated production partner that was situated in a distinct region of the world.

This thesis sets out to clarify the structure of the industry by demonstrating that mass market automobile production is technically distinct from other manufacturing processes due to the unique characteristics of the production technology. The thesis describes how the consequent economies of scale, which imply matching scale in related production processes, are well documented in the literature and thus indicate the trend for convergence. However, the existence of economies of scale does not in itself compel an organisational structure, this thesis considering scale and corporate structure as conceptually separate. Convergence on a single form of organisational structure is not explicitly articulated in the existing literature and this thesis analyses the make-or-buy decision that motivates vertical integration in terms of transaction cost analysis, as espoused by O E Williamson.

The purpose of this thesis is to then propose a model for an automobile firm in terms of its output and its organisational structure. Figure 1.1 shows how the thesis will take these two separate and distinct theoretical approaches to demonstrate how the two types of firm, the prototypical and the industry leader, operate within the paradigm for the automobile industry.

Figure 1.1 Fundamental arguments to the automobile paradigm



From this study it will be possible to derive a systematic understanding of the shared theoretical orientation of automobile companies before they are adapted to fit their own specific contexts. The thesis will suggest a generic conceptual framework for automobile companies by constructing an automobile industry paradigm. The paradigm includes the main economic factors influencing the industry and so provides the defining features of an automobile company. The paradigm therefore describes an automobile company that comprises all the requisite functions and is exploiting the available economies of scale in each of them. The research will then look at how automobile companies compare with the theoretical precepts of the automobile industry paradigm and the extent to which they meet the parameters of the paradigm. Of particular interest will be the options for companies that are wholly uncompetitive. The research will consider how they might attempt to approximate to the paradigm using alternative organisational structures. The thesis thereby encompasses three research issues:

1. Optimal automobile company size with reference to economies of scale.
2. Optimal automobile company organisational structure in terms of vertical integration.
3. The degree to which uncompetitive firms can approximate to the optimal size and structure.

Since these issues determine the research methodology, the methodological options will be discussed in Chapter 2 and the resultant research design in Chapter 3, in advance of the theories concerning firm size and structure. The research is focussed on the concept of the company so Chapter 2 shows how the case study approach can be most appropriately applied. The case study approach is discussed as a research strategy involving a palate of different research tools and designs. The nature of the data required is crucial in indicating the appropriate gathering techniques and although much of the theory concerning the automobile industry paradigm was derived from literary sources of data, primary data was also gathered from industry sources in order to provide a context for the theory.

In the case of this research programme, interview based fieldwork is put forward as the appropriate research tool and, since the research questions are concerned with overall industry strategies, the interviews have been conducted with those who have most influence or contact with those strategies. As these interviewees can be considered the elite in their fields the term 'elite interviews' is used. Furthermore, in order to allow these elites to expound their knowledge the semi-structured interview is considered the most appropriate technique to use. In order to develop the emerging information the interviews are linked, each one informing the next in a systematic manner reminiscent of the 'laddering' technique used in marketing research. Concerns over validity, generalisability and reliability, are also discussed in this chapter.

The specifics of the research design used in the research programme are then described in Chapter 3, restating the research questions and the reasons for the selection of MG Rover as the main case study company. As the research commenced, MG Rover offered more than accessibility; it was also an apposite opportunity to assess the research questions and the emerging theory of the automobile paradigm. In order to put the company into its industrial context the same interview protocols were

extended into studies of a wide variety of automobile companies operating within the definition of the same paradigm.

The dependence on elite interviews meant that company access had to be carefully managed, not only in the main case study but also in the contextual industry and related organisations. The use of multiple sources of data from the case study and contextual companies countered the effect of bias, triangulation being the term for validation of data by corroboration and cross-referencing. The interviews took place throughout the research programme, being continuously transcribed, coded and analysed. The paradigm was formed through an iterative process of data analysis and theoretical discussion. Thus, the early interviews aided in the initial formation of the paradigm while later interviews refined it further and provided a contextual perspective to the theoretical concepts. Since the data emanating from these interviews is related to the theories that comprised the automobile paradigm theory the data is used to contextualise the theories in the specific chapters where they are presented.

Having established the nature of the relevant data and how it would be used, the next two chapters build up the conceptual framework. Chapter 4 looks at the industry from the perspective of size and thus the presence of economies of scale. For the modern mass market automobile industry the defining characteristic is the steel load-bearing body, for which the production technology is the body-in-white (BIW) process. The other processes inherent to automobile production are research and development (R&D), powertrain and final assembly. The defining role played by the BIW process has been termed the Budd Paradigm (Nieuwenhuis and Wells, 1997; 2007).

This thesis uses Stigler's survivor analysis to comprehend the prevailing economies of scale in the industry. The research categorised total global output into output ranges in order to reveal any change in the share of the total for each output range. The results did not conclusively define the economies of scale in the industry but they did indicate two broad trends. Firstly, that the output range above 2.5m units was continuing to expand in it share, and secondly, that although the 0.5m to 1m range was shrinking there were manufacturers within it that had survived for many years and were even growing. It seemed that this apparent polarisation in the industry was

due to the continuing expansion in global output which meant that the industry had yet to stabilise.

The research then estimates the minimum efficient scale (MES) for an automobile firm as a whole from the minimum efficient plant size (MEPS) for each process. The data was gathered from archive and company sources for those firms that the survivor analysis had identified as showing longevity. For added contextualisation the data gathered by this research was then compared with the data found in the literature and company sources. Taking into account the trend for the larger companies to be expanding market share, the results indicated the presence of two types of company. The first is a company with output of around 600,000 units a year that exploits, as far as is realistic, the available economies of scale. This might be termed the prototypical firm since it forms the basic unit of the industry. The problem for such a company is that fluctuations in output can lead to damaging variations in costs, so the second type of firm is one that has taken a strategic course for expansion and become an industry leading firm. Although larger firms can suffer diseconomies of scale, partly due to rising R&D costs, their higher output and wider model ranges are found to diversify risk and reduce the effects of fluctuations in output volume.

However, the MEPS found for each process does not *ex ante* necessitate their vertical integration within a single company's boundary, notwithstanding the conclusions concerning MES. On the basis of scale alone there is no reason why the other processes, being technically unrelated to BIW, should not be part of the external supply industry and so it is not possible at this stage to define which elements should be included in the vertically integrated automobile industry paradigm. For this reason it is necessary to evaluate the extent of the vertical integration of a paradigmatic automobile company using a different theoretical approach.

Where the preceding chapter examined the scale of the different operations, the principles of vertical integration that might be common throughout the automobile industry dictate which elements, or processes, should be included in the proposed automobile industry paradigm. The organisation of the automobile company is discussed in Chapter 5 which investigates the structuring forces within industry. It follows O E Williamson's use of transaction cost analysis (TCA) to examine the

dichotomous issue of whether a company should buy a product on the market or make the product itself in an internal company function.

Internalisation of functions results in vertical integration and this thesis proposes a model of comprehensive integration, terming this structure the full-function model in order to avoid references to full vertical integration which has no predefined limits. The cost advantage of internalisation is that it reduces the economic friction of market-based relationships between the functions, which is experienced in the form of opportunistic behaviour by participants as they exploit asset specificities. This enables the opportunists to extract *ex post* advantages unforeseen in the original contract and Klein (2000) thereby demonstrates that opportunism is primarily due to the human actors, though they may use the physical assets as the mechanism by which to extract the benefits. This has implications for governance structures, such as Chandler's concept of the multi-divisional M-Form of corporation, which are here viewed as coping mechanisms for managing the integrated corporate structure.

The considerations of economies of scale from the preceding chapter are then applied to the full-function model of the automobile industry to produce a size and structure for an automobile company. The discipline of the resulting format is such that this thesis considers it to represent a paradigm in automobile manufacturing, which in this thesis is called the automobile industry paradigm. Using the MEPS and MES data a model for a prototypical firm is constructed which then forms the basic unit for the industry. Since firms expand by the addition of complete plants the firms can be considered to grow by units of MEPS and, in combination, MES. However, for firms that have not reached the prototypical state, the units of MEPS may not exist for all process and the firms will have to find approximations of the size and structure advantages enjoyed by prototypical firms within the paradigm. Chapter 6 therefore discusses the range of options for approximating to the automobile paradigm. These include exploiting economies of scale through extension of the product cycle and more intensive use of the production facilities. Alternatively, from a structural point of view, an uncompetitive company could only achieve lower structural costs if it is able to find a novel form of organisation that can replicate the cost advantages of vertical integration. This means forming a relationship with an external company, but not through the mechanism of the market, which would carry with it the economic

frictions that the full-function structure of the paradigm is designed to avoid. The research investigates ways in which the full function organisation can be divisible between partner firms whilst retaining the advantages of vertical integration.

From Dussauge *et al.* (2004) two forms of alliance are found to be particularly promising, the scale alliance that shares functions in order to exploit economies of scale, and the link alliance that permits mutual learning by the two parties. Scale alliances are found to be long lasting due to the persistent requirement for scale while link alliances have been found to last only until the need for knowledge is satisfied or one partner asymmetrically gains an *ex post* advantage over the other. However, this research uses TCA to suggest that link alliances are more enduring if the partners have ownership of complete and complementary functions. Any *ex post* learning benefits would then accrue solely to that partner and so eliminate the risk of opportunism. The structure by which this can be achieved is the vertical joint venture (VJV), each partner being assigned to discrete functions which make up the full function structure.

Chapter 6 also looks at international opportunities to reveal any divisibility of the full function structure. This focuses on the foreign direct investment (FDI) literature, starting with the work of Hymer and elaborated on by Kindleberger. However, as Schott (2003) argued with regard to international factor endowment differentiation, international opportunities are not fixed. For a more dynamic aspect, Vernon's product cycle and stage theories of progressive internationalisation are introduced. Taking the different theories to be mutually exclusive Dunning draws their aspects together within the wide ranging eclectic theory, which covers international opportunities in ownership, location and internalisation (OLI).

Strategic theories of FDI, as put forward principally by Cowling and Sugden, suggest that firms may engage in FDI in order to enhance their competitive position relative to rival firms. This research found that firms will expand output capacity in order to diversify risk, much of this expansion taking place overseas. However, FDI is only incidental to this strategy since the same result could be achieved within the home market if it could support the output volume. Although strategic theories of FDI are informative, this research is interested primarily in the underlying economic factors

that impinge on the industry and as such it is these that remain the focus of the study. Instead, factor endowment differentiation can be applied to the VJV structure such that the respective partners take responsibility for those functions in which they are already endowed with the relevant factor advantage. The discussion culminates in the proposal for structural and global division of the full-function model in the form of an international vertical joint venture (IVJV).

The empirical support for the IVJV is then presented in Chapter 7 of the thesis. The chapter is divided into two parts. The first deals with the contextual companies, all of them firms competitive within the paradigm or else part of consolidated groups that are competitive. The second part of the chapter then charts the decline of MG Rover's predecessors, BL and Rover Group, to provide an historical perspective on MG Rover's condition during the period 2000-2005. The reasons for the ultimate demise of MG Rover in 2005 will be discussed along with the partial failure of the company to enact an IVJV. As an adjunct to the collapse of MG Rover, Chapter 7 also discusses the manner in which NAC and SAIC, two Chinese automotive manufacturers, purchased the respective physical and human assets of MG Rover yet both pursued variations of the IVJV structure, thus replicating the advantages of the automobile industry paradigm. More recently the two companies have been exploring merger options, a possibility that is discussed in terms of its impact on the emerging IVJV structure.

Chapter 8 does not set out to revisit the arguments and conclusions given in each of the preceding chapters but to demonstrate how the research findings change the established understanding of the industry. The current state of the industry is discussed, including the opportunities that exist for companies within the paradigm as it stands. This has implications for companies of all sizes, but most particularly small firms and the national policies that are intended to encourage their sustainability. The paradigmatic view of industry can also be used to gain a similar understanding of other industries. The discussion is then widened to evaluate how this paradigm might change, or a new one develop, if oil based fuel were to be phased out. Although this represents a future for the industry that cannot be known at this stage, it is hoped that through this research a good understanding of the present paradigm, and the opportunities it offers, will provide an informative context for the next paradigm.

2: Methodology

The research programme is shaped in accordance with two factors: the methodology to prescribe the overall structure, and the research design to describe the construction of the research in question. The first deals with the theories pertaining to rational investigation and draws on authoritative sources, the second applies them in the practical setting of the specified research. To clarify this distinction, methodology and research design have here been separated into two chapters. The purpose of this, the methodology chapter, is to establish the scientific credentials of the case study research strategy and so validate its use in the research.

This chapter will show that the research questions are the ultimate guide to the selection of the case study method and the relevant literature. The research questions of this thesis are concerned with the basic structuring of the automobile industry and so determine the direction of the research programme. For this reason the research questions open this chapter to show how they guide the structure of the research with reference to its fundamental methodology. From methodology the research design is described before continuing with chapters that take up the purpose of the research questions by reviewing the literature and bringing in empirical data.

The methodology will delineate the options that are available before the final design is discussed in the following chapter. Having determined the structure of the research from the research questions the subsequent chapters will discuss the literature relevant to the subject of the study, i.e. the structuring of the global automobile industry. The methodology and design chapters also determine the nature of the empirical data gathered during the fieldwork phase and the literature in each of the subsequent chapters will be contextualised by this primary data. This again emphasises the sequence of chapters in this thesis from methodology and design to the theory of the automobile industry paradigm.

The implementation of the case study approach is complex and requires careful evaluation before using it as a solid foundation for the research. The case study methodology is deceptively simple and as a research strategy it can include a range of

research techniques, some derived from other disciplines. Having reiterated the research questions, the case study approach must itself be distinguished from others that might be available. It then remains to discuss the range of research techniques that can be used within its framework. Chapter 3 will show how the final research design was selected.

2.1 The role of research questions

The research questions for this thesis were set out in the preceding, introduction chapter. The initial questions seek to determine the limiting forces of the automobile industry in terms of size and organisational structure, while subsequent questions seek to examine whether there might be exceptions. In essence they are a call for clarity in developing a view of the industry and a point of commencement for the literature search. The subsequent literature search is therefore concerned with defining the structuring effects of economies of scale and scope alongside transaction costs, then finding how these conditions may be satisfied through a novel firm structure. Since the research questions determine the kind of information that is required it is necessary to first define how it should be obtained. The research questions therefore guide the methodology, which then informs the literature search and fieldwork.

Stake (2000) acknowledges the importance of research questions but terms them as issues, the select questions that plan and structure the study. With the case study approach taking a holistic view of both case and context it is the research questions that define the elements of interest. This suggests that the case study approach is not a methodology in itself, for it is the research questions, or issues, that guide us in that direction. Indeed, there appears to be agreement that this is so, with some authors portraying the case study instead as a research strategy (Kitay and Callus, 1998; Yin, 1994).

2.1.1 Scope of investigative methods

There are, of course, a variety of investigative methods available but each has its own particular application. Yin (1994) puts forward four research strategies: experimental, survey, archival, historical and case study (see Table 2.1). The customary view has

been that each has its own application, whether exploratory, descriptive, explanatory or causal. Instead, Yin (1994) believes that each strategy can be used in any of the applications, but emphasises that it is the form of the research questions that determines the choice of application, categorising them into "who", "what", "where", "how" and "why". The author also introduces two more elements for consideration: control over the subject of the study and time relevance as deciding factors in selecting the research strategy. Control over the subject concerns the ability the researcher has to manipulate the conditions of the study, while time relevance concerns the degree to which the focus is on contemporary events. Table 2.1 shows how five separate research strategies, one of them the case study, may satisfy these conditions in different ways.

Table 2.1 Applications of research strategies

Research Strategy	**Form of research question**	**Control over subject**	**Contemporary events**
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes/no
History	How, why	No	No
Case Study	How, why	No	Yes

Source: Yin, 1994

The experimental research strategy puts the emphasis on control and it attempts to expose underlying mechanisms. For Yin (1994) this is about answering "how" and "why" questions by controlling the variables. Plutchik (1983, p.16) states that the purpose of the approach is:

"...to increase our understanding of and our ability to control and predict events".

In Yin's definition the experimental research strategy is concerned with a high level of control over current variables and Plutchik provides four reasons why control is advantageous: to determine relations between the variables, to extend the conditions of the study, to improve reliability and to test a theory. The experimental strategy is therefore an approach that takes the variables out of their context and places them in an artificial situation. The experimental researcher can then isolate the independent variable and manipulate it so that its influence on the dependent variable is as conclusive as possible. It is necessary to ensure that the variables are valid representations of the wider population that the experiment is designed to study, so sampling bias is a particular concern. If the experiment is valid then it is then possible to generalise the findings to the original context.

The survey strategy also involves investigating samples of a defined population but studies them in context rather than an isolated situation where the variables may be controlled. It is concerned with "making statements" about a particular field of study (Fife-Schaw, 1995, p.100). Surveys are intended to measure a target phenomenon that exists within that population or is experienced by it. For example, a survey might measure business confidence amongst managers of the current economic climate and by using statistical techniques a consensus can be arrived at. The strategy is highly structured and standardised so is not conducive to recording singular judgements or assigning weight to those judgements. In measuring business confidence it would be difficult for a survey to account for the status or experience of the respondent, neither could it pursue novel responses into greater depth. Surveys are a reactive approach; there is no attempt to actively manipulate variables although they do benefit from the rigour of their robust design.

According to Yin (1994) archival strategies pose similar questions to survey techniques and are interested in quantifying the subject of the analysis. Here, though, the investigation is conducted through the analysis of records and so uses data that has already been recorded. When the data has been retrieved it can be manipulated using the same analytic methods as if it had been gathered specifically for the research. It is appropriate when the research is seeking to describe the prevalence of a phenomenon that occurred in a widespread form. Yin (1994) suggests that research into epidemics is well suited to archive research. The approach can be of benefit when investigating

organisations where access to individuals may not be consistent or may present short-term access problems (Bryman, 1989). In such situations it can be useful in providing background material or else data that can be more readily found in archive form and therefore relieves the researcher of the need to gain access to the subject of the research.

However, the researcher has little control over what the archive can yield and since any information is filtered through these records it is not possible to use the standardised techniques or sampling seen in survey techniques, although the archive material may include survey data. Archive research is also dependent upon the availability and quality of the material. However, when it is possible to access data of the same quality as new primary data then it is an opportunity to reinterpret in the light of new information or theories. For example, it might lend itself to research in politics where sufficient access might be difficult to achieve but large amounts of data are within the public domain.

Historical research has a similar research design in that it draws on previously collected data but it takes a more holistic, time bound approach. As Chase (1995, p.315) states, the context is of primary importance:

"From the perspective of the researcher these are 'natural' conditions, that is, they have not been determined by the researcher."

Although surveys are also conducted in context their rigid structure is used to regulate the degree to which the context interacts. Alternatively, archival research is only coincidental with the time period, there should not be a time relation between the data and its context. Historical analysis, however, is open to the interaction between subject and a time related context. For example, Lord and Hohenfeld (1979) looked at how baseball player performance was affected by job security anxiety during a period in the mid-1970s when the negotiation procedures in the game were being changed. The research used archival research in the form of game data but tied this to the context of the period. It was therefore possible to test out the predictive powers of equity theory, i.e. whether the players would perform less well because they felt less valued. This is different to archival research which obtains the data in order to bring

depth to the sample and is not expressly concerned with taking an overview of the subject within its context. However, like archive research, it is dependent on finding data and historical analysis that is consistent with the design and purpose of the research programme so it is at risk of any bias that exists in the original data.

Like the history strategy, the case study approach investigates the subject of the research within its context. Indeed, the distinctive feature of the case study research strategy is that in studying the subject in its context it is not only distinguishable from the other strategies but also in direct opposition to the experiment research strategy. In another publication, Yin summarised the distinction as follows:

"Compared to other methods, the strength of the case study method is its ability to examine, in-depth, a 'case' within its 'real-life' context." (Yin, 2006, p.111.)

Case studies are marked out by the focus on contemporary context and also the lack of control over events. Historical analysis, though useful when defining contextual issues, does not focus on the contemporary because it is interested in a complete time period, one where the predictive potential of the data can be fulfilled. The experimental strategy is restricted by the need to take control over events and it attempts to isolate the research from the context, while the survey approach regulates the context by using a standardised and targeted design. When the subject of the study exists as an integral part of its context it is vital to master the nature of the context so that its interrelationship with the subject can be understood. To not do this would be to allow the research to become the victim of capricious circumstance.

The emphasis here is on having control over the research design through a deep understanding of the nature of the context/subject relationship but not active control of how this relationship can be manipulated and tested. The purpose, then, is to construct a research design that can elucidate a bounded system, or in Stakes words (1998, p.88):

"...the researcher temporarily subordinates other curiosities so that the case may reveal its story".

Stake is instructing that it is not acceptable to simply investigate without purpose; certain views of the data must be suppressed so that the relevant ones might emerge. No prescriptive method is available but this is because the appropriate method is determined by the nature of the case and, as Yin (1994) would add, the guidance of the research questions. Denscombe (1998) contributes to this argument by stating that a case study is appropriate when the researcher has little control over events so it is not possible to regulate, *a priori*, the methods suitable for a specified case study. Equally, a case study research strategy is not necessarily qualitative or quantitative, it depends on the research questions and the units of analysis as will be discussed in the following sub-section.

2.1.2 Qualitative and quantitative research designs

The complexity that the case study approach preserves and investigates tends to lend itself to the qualitative research design. Creswell (2003) describes qualitative research as being emergent, flexible, interpretive, broad ranging and conducted in its "natural setting" or context. Yin (1994), however, points out that these qualities can be applied to any of the five research strategies (see Table 2.1). It is quite feasible for psychological experiments to collect qualitative data on human perceptions, or surveys to collect quantitative data. It is therefore the nature of the data requirement that determines whether the data should be quantitative or qualitative, and a case study may even mix the two:

"...case studies can be based on any mix of quantitative and qualitative evidence." (Yin, 1994, p.14)

Lee (1999, p.38) particularly looked at the application of qualitative research to organisations and found it to be useful for describing, interpreting and explaining:

"...qualitative research may be the best choice when the identification of new theoretical propositions of managerial actions is deemed necessary."

In contrast, quantitative data is more useful for generalising or calibrating when the data is measurable on a scale. This is not always possible with economic concepts

which may use numbers to describe particular phenomena or characteristics, but the exact relationship of the measurements may not be exactly known. For example, Manager A may state that production is efficient at output 1X while Manager B at another firm may give output 2X; although 2X is double that of output 1X, the efficiency difference may not be precisely quantifiable on the same scale.

Other economic concepts such as risk and opportunism will ultimately affect the financial performance of a company, but not in a way that is quantifiable in precise terms. Miles and Huberman (1994) take Lee's interpretive line and argue that qualitative analysis can infer causality. Miles (1979) describes "goal-system state analysis" where the organisation's goals are defined quantitatively but the analysis on how they might be achieved is qualitative. Since the connection between the goals and the means by which they are achieved is complex it can uncover a rich seam of conceptual insights. Qualitative data in this context:

"...lend themselves to the production of serendipitous findings and the adumbration of unforeseen theoretical leaps." (Miles, 1979, p.590)

This might be made explicit by management in an organisational setting when indicating how different concepts fit together, a process which gains in power if the management is particularly highly placed or influential. When context is important the research is aided by this interpretation, either by the researcher or the respondent, because quantitative analysis that attempted to take into account all economic factors would be impossibly complex. There may still be data that is quantitative in nature, but it is in the treatment of this data that the research is qualitative. The method by which qualitative and quantitative approaches are differentiated for this research programme will be discussed in the next chapter while the theoretical aspects of the case study approach will be further examined in this chapter in the section below.

2.2 Case study design

The case study has often been viewed as a soft option, a useful pedagogical tool but lacking the rigour necessary for research. It is often used to elucidate particular arguments, or in journalistic lines of enquiry to fill columns in national newspapers. De Vaus (2001, p.219) is quite blunt in summarising the historical status of the case study design approach:

"...for many years the case study has been the ugly duckling of research design".

A well-chosen case study can be an excellent rhetorical device for expounding a particular view or opinion. Its use in such a situation invites the application of a model answer to match the construction of the scenario, a symmetry that is unlikely to be available in research. Michael Edwardes, on completing his tour of duty as head of the British car manufacturer BL, recorded his experiences in the book "Back From The Brink" in 1983. However, this was in no way an academic assessment of the period, being more autobiographical than objective. The author supplied the scenario and gave his view of it, predictably without contradiction. This is not to say that the author's recollections cannot serve as a valuable resource, but that the views expressed require validation.

2.2.1 Critical perspectives

The populist use of the case study as a narrative gives rise to *ex post* theories, descriptions of the processes but no opportunity to uncover the mechanisms of cause and effect. Academic research needs to dismantle, in some way, the mechanisms that work the case under investigation and put forward theories that increase the body of knowledge. The popular criticism of case studies is that they do not do this. While they are fine as a pedagogical tool, or for generating hypotheses for future study, they are seen as lacking the rigour that cements the foundation of 'hard facts'. Consequently, generalisations are often consigned to the level of speculation by the author. For example, when Edwardes made his initial report to the National Enterprise Board in 1977, he listed over thirteen factors that he felt were contributing to British Leyland's lack of competitivity (Edwardes, 1983).

However, it would be premature to dismiss the case study approach based on its popular usage alone. When dealing with social phenomena, and this includes the commercial world, it can be difficult, if not impossible, to separate the subject of the study from its context. The case study permits, even compels, research *in situ* and theoreticians have attempted to bring scientific rigour to it. Hakim (1987) describes five kinds of case study: individual, community, social group, organisation and events. Each type recognises the value in studying certain kinds of material within its context, a context with which it is inextricably linked. However, this systematic identification of case study types suffers from using *ex post* categorisations of studies completed, rather than providing a prescriptive framework for use as a methodology.

Yet case study research does have academic standing and Hamel (1991) and Tellis (1997) remind us of the first use of case studies by the Chicago School for researching the city in the early years of the twentieth century. Indeed, de Vaus (2001) points out that case studies have been fundamental to advances made in the social sciences while conceding that there has been a lack of systematic evaluation of the precise role of the approach. The subsequent decline in its use has been attributed to the rise in status of quantitative methods, but concerns about their applications in social research brought about a renewal of interest in case studies (Tellis 1997). It therefore remains an active research approach.

2.2.2 Defining the case study as a research strategy

When the subject of research is being studied in its context then the usual scientific controls cannot be applied, yet the inherent complexity is the very substance of the research. Kitay and Callus point out (1998, p.104):

"The great strength of the case study design is that...it allows the researcher to place the information in a wider context."

Denscombe (1998, p.39) also states that the chief advantage of the case study is this chance to:

"...deal with the subtleties and intricacies of complex social situations."

Not only the context but also the internal elements of the subject matter, as noted by Rossman and Rallis (1998, p.175):

"Case studies are uniquely intended to capture the complexity of a particular event, program, individual or place."

With the case, the research programme seeks to understand that unit as a whole, informed by the context within which it is found. The case might be an organisation, an individual, a person, an event or a decision making process. In medical research the case almost seems to choose itself: it has to be studied in order that a cure might be found, but the research could involve various techniques from bacteriology to homeopathy. This is not to suggest that any subject of study can be termed a case or else there would be an *ad hoc* selection of the approach for research. The case has to be specific enough to describe a system, or as Stake (1998) defines it, the case must be a bounded system. Denscombe (2003, p.38) agrees and describes a case as having "a fairly self-contained entity" with "fairly distinct boundaries", thus implying that the specifying of the boundary is unlikely to be exact. The case has an internal consistency and set of interrelated factors that distinguish it from its context, yet it must interrelate with its context in a distinguishable manner. If the case could be removed from its context then experimental methods could be applied, but instead the context is a necessary part of the story.

The defining of the bounded system throws the ontological considerations into sharp relief. Whereas in the natural sciences the ontology is implied when the premises are specified, for the case study the scope of the research has to be confirmed. The impact of a case study goes beyond its immediate context, for even the context has a wider environment, but just as a natural science experiment isolates the independent and dependent variables from the infinity of existence so the scope of the case study must be reined in and only the salient factors considered. Kitay and Callus (1998) tell us that this can be achieved by specifying the units of analysis, even if the nature of the particular project means that they might only be defined in the course of the study. De Vaus (2001, p.220) puts greater emphasis on the units of analysis and defines the case as:

"...the unit of analysis about which we collect information".

This conclusion seems to deny a distinct methodology when one considers that the wide number of techniques allowed under the auspices of case study research, from qualitative to quantitative, implies that the case study approach is little more than an umbrella term of little inherent scientific credibility. In other words, it is as if the scientific researcher has failed to isolate the object of the study and so has left it in its context as a "case" but intends to employ scientific methodology henceforth. This is unfair since the case in its context is precisely the object of study and as such guides the research strategy towards certain techniques and precludes others. This falls within the remit of Kuhn's polemic on the paradigmatic structure of science and this will now be explored.

2.2.3 Kuhn and paradigm revolutions

Paradigms are frequently cited as providing a structuring framework for scientific research. Kuhn (1970) is the main proponent of the paradigmatic view of scientific thought. He emphasises the revolutionary nature of scientific progress which is rooted in the sociological and methodological structure of scientific communities. Kuhn sees "normal science" as being one where research is based on previous scientific achievements that have come to be accepted by a scientific community as the foundation for future practice. Kuhn then relates this to his own concept of paradigms where scientific practice, comprising law, theory application and instrumentation, form the basis for cohesive traditions of scientific research. For Kuhn, science itself is defined by paradigms and within a paradigm normal science can be practised (Chalmers, 1983). Chalmers clarifies this notion of normal science as:

"...a puzzle solving activity governed by the rules of a paradigm." (Chalmers, 1983, p.92).

According to Kuhn, normal, or paradigm based, research is said to possess three foci: definition of a revealing class of facts, a comparison to the paradigm's predictions and continuing articulation of the paradigm theory. Kuhn refers to a mature scientific

community, a community made up of factions loyal to rival paradigms. In comparing these paradigms the scientific historian can discover elements that:

"...the member of that community may have abstracted from their more global paradigms and deployed as rules in their research" (Kuhn, 1970 p.43).

This dilutes the original concept of a paradigm as being a self-contained and self-defining scientific tradition, suggesting that it is more akin to a node of activity or a recognised reference point for the wider physical science community. Indeed, Kuhn prefers to use the term "disciplinary matrix", the members of which agree upon formal expressions of symbolic generalisations such as basic formulas, a foundation of basic conceptual models and commonly held values. This allows the use of shared principles to be applied in different analytical settings and paradigms.

Kuhn states that the period of normal science within the paradigm is an opportunity to pursue detailed research without having to waste resources defending the fundamentals that underpin the paradigm, these being already generally accepted. This would lead to a paradigm taking up permanent residency within its field of research were it not for the periodic revolutions that enable human understanding to lurch forward. It is the well-defined, self-referential nature of paradigms that means a competing paradigm will be exclusive and the transition to it must be revolutionary. Kuhn sees a dominating paradigm providing a clear set of laws governing the activity of scientists, until they lose faith with the laws and the paradigm in a revolutionary change. As Williamson (1998, p.25) puts it:

"...it takes a theory to beat a theory."

Lakatos points out that this means that revolution is extra-scientific:

"Scientific change is a kind of religious change." (Lakatos, 1970, p.93.)

The message Kuhn has for practitioners within a paradigm is to engage in detailed research but be aware that a developing mismatch between the paradigm and nature will necessarily entail the creation of an entire new paradigm. Thus, paradigmatic

science can be said to be an organiser of theory, data collection and testing, permitting progressively focused research without the need to reiterate accepted fundamental concepts. This is a view that constrains future research by binding it to established customs. The next sub-section of this thesis will explore the definition of paradigmatic science in relation to case study research.

2.2.4 Case Studies as paradigm and methodology

Kuhn's theory of the paradigmatic nature of science was discussed as a device for describing the conceptual frameworks of scientific study. The same reasoning can be applied in order to bring a coherent structure to the case study as a methodology. It is apparent that there is a scientific community and literature growing around Robert Stake and Robert Yin, it being seemingly impossible to refer to the case study literature without quoting extensively from the two authors.

The case study is distinguished by the crucial role played by contextual factors, and indeed this puts it into conflict with natural science research strategies. A well-documented feature of paradigms is that they are mutually exclusive and therefore the change from one to the other is revolutionary. Although the exact character of the case study research strategy is not strictly defined, the continuing debates converging on a precise definition would be the "mopping up" described by Kuhn (1970) and a feature of normal science. There is also general agreement by adherents of the approach that the case study permits a variety of methods to be conducted in its name:

"...in practice they often require researchers to make use of more than one, and often many, different research methods." (Kitay and Callus 1998).

Indeed, the very complexity of the case study suggests that more than one method is *de rigeur*, that a pallet of methods is not an option but a requirement. This would mean that the case study methodology employs particular research techniques at a sub-category level. It would therefore be quite acceptable for, say, survey techniques to be used as a contributory part of the case study method if it was part of an organised portfolio of valid research techniques. Referring to Chalmers (1983) and his "puzzle solving", if a methodology is the conceptual structure that permits the activity

then the case study achieves that through its ability to solve puzzles. Since puzzles come in many forms the efforts to find solutions will not be uniform. For this reason, case studies will not all be designed according to a single format, instead offering different types of case study for the puzzle solver.

2.2.5 Types of case study

Stake (1998) describes three types of case study: intrinsic, instrumental and collective. An intrinsic treats the subject of the study as a unique case and the purpose of the research is to gain an insight into a singular phenomenon. Denscombe (1998) points out that a strength of the case study is the ability to concentrate the limited resources of research in one small area and we can see that this is particularly true of the intrinsic study. There are still possibilities for generalising the intrinsic case. As a case study a small company has intrinsic interest, but because it exists within the same commercial context as other firms in the industry there is an opportunity to gain perspective on the industry at large.

This leads into the notion of the instrumental case and how a case can be used to gain understanding of a promulgated theory. The case is chosen as being exemplary of a theory, but difficulties over the unique characteristics of the case will persist. The nature of the context each company finds itself in will limit the ability to hold it up as being typical of a theory, the purity of the exemplar being contaminated by the relationship with its context.

Although intrinsic and instrumental cases are single case studies where resources can be concentrated efficiently, at the same time the wider perspective is lost. De Vaus (2001) offers the concept of the critical case which, like Stake's instrumental case, is an apposite test of a clearly defined theory. Again, though, the case cannot be separated from its context so it is not possible to use it to falsify a theory, only to provide a supporting (or contrary) argument. Furthermore, it might be impossible to distinguish the uniqueness of a case unless deliberate reference is made to other cases within the same context. This suggests a grouping together of cases for investigation, as described by Stake's collective case.

2.2.6 Stake and collective case studies

Stake (1998) puts forward the notion of collective studies, essentially multiple instrumental cases. By studying the theory across cases it is hoped that the idiosyncrasies of each firm can be controlled for and general principles derived. The research should be wary of alighting on contrasting cases since that could simply give rise to multiple intrinsic cases, the uniqueness of one shedding no light on the other. A collective case study would therefore need to cover more than two cases and they should be conceptually related to one another.

Care should also be taken when basing the research on just two cases for design reasons. In selecting cases for collective study there can be problems of sampling bias since the most representative cases may not be the most accessible. If the researcher is forced to accept those cases that do afford access then a certain amount of sampling bias might have to be confronted. The problem is also relevant within the case study where the ease of access to particular departments and personnel may differ, or the role of the gatekeeper may have a strong influence on the data that can be selected. The danger that the representative might have the power to channel information is only mitigated by the risks being apparent to the researcher, who then puts in place devices to counter the effect. For example, the researcher could endeavour to build an independent network of contacts.

Robert Yin acknowledges that the complexity of the case study approach is not simply between the case and its context, but also between the cases in a collective study. Rather than referring to multiple cases as collective he prefers the term matrix to represent the interrelation of the cases.

2.2.7 Yin and the matrix

Yin (1994) describes greater complexity in how a case study research strategy is put together and applies a matrix structure to the categorisation of case studies. There are single case and multiple case designs, and they may each include holistic or embedded units of analysis. A unit of analysis is the object of the study and includes events, individuals, occupations and so on. The single case is similar to the

instrumental and intrinsic cases above, but Yin divides it into the three sub-sections of critical, extreme/unique or revelatory cases.

The extreme/unique case study is analogous to the intrinsic case and, as before, it is challenging to apply this in research of commercial organisations that are inextricably linked to their industrial contexts. When the opportunity arises for exploratory research that has not been previously possible, then the single case study can be termed revelatory. However, all single case designs suffer from their uniqueness and subsequent lack of generalisability. The multiple case design addresses this point by following replication logic so that the cases reveal either similar results for mutual support, or contrasting results for predicted reasons. This should not be confused with sampling logic: the cases are not samples selected from a wider population. A useful comparison here can be made with the method of dialectics. Benson (1983, p.333) supports the idea of extending dialectics beyond Marxist applications:

"Dialectical analysis must be concerned with the emergence within a social formation of new, incompatible components."

While a comparison of different companies does not approach the scale of argument implied by the social tensions that drive the Marxist dialectical view it is, nonetheless, instructive. If the data from the cases is set against each other in a dialectical style then the data from the approaches can be used to reach an acceptable resolution.

Looking inside the case studies it can be found that, for either single or multiple case studies, the choice of unit of analysis is a problem that characterises the research strategy. These units of analysis might be holistic or embedded (Yin, 1994). The holistic design can be used when the case and the unit of analysis occupy the same area of research, the holistic case therefore comprising the bounded system. Yin (2006) suggests that one example of an holistic case in education would be researching the implementation of a school-wide programme. Embedded case studies use multiple units of analysis to research the case, Yin returning to his example of a school wide programme but this time the data would be collected from a number of different classes within the school, the classes comprising the embedded research

design. Neither holistic nor embedded designs are exclusive to single or multiple-case designs, Figure 2.1 illustrating the resultant matrix of four types of case study.

Figure 2.1 Basic types of case study

	Single-case	Multiple-case
Holistic	Type 1	Type 3
Embedded	Type 2	Type 4

Source: Yin, 1994

The intrinsic, instrumental and collective approaches should be seen as having a dynamic relationship with each other. An intrinsic case study can give rise to theories that can be tested in instrumental or collective studies. De Vaus (2001) sees this as vital in generating causal explanations. De Vaus also provides another perspective on Yin's (1989) suggestions, distinguishing between cases as single entities and cases that contain multiple aspects, the previously discussed holistic and embedded designs. A company could be treated as a single entity at the holistic level, looking at the actions of the company as a whole piece. This would include such concerns as level of sales, productivity, financial reports and so on. The embedded design takes the components of the case as the units of analysis. This could involve investigating how the different divisions of the company work together to formulate a company policy. This approach would need to recognise that a synergy exists between the divisions and so all the divisions require consideration.

2.3 Data collection

In order to maintain the relationship between the case and its context it is necessary to call on non-invasive forms of data gathering. Case studies are distinguished by gathering data from contemporary events using observation and interviews (Yin, 1994). The interview situation can, to some extent, be manipulated by the researcher but not to the same degree as is possible with an experimental research strategy. The control element of case study research concerns the choice of questions by the researcher, but to manipulate the interview would be to inhibit the discovery of new data. For example, Eleanor Miller (1986) discovered in her study of female street hustlers that while the context remained constant each respondent had their own story to tell. Submission of a questionnaire would have handed control to the researcher but at the same time created a rigid process too inflexible to allow personal expression. The respondents can be seen as experts in their field and it would be presumptuous for the researcher to narrow the scope of their answers before they had even begun. With research on companies, where data is gathered from managers experienced in the industry, the respondents are undeniably the experts in their areas and need to be allowed freedom of expression. The case study approach allows this when used in conjunction with semi-structured elite interviews.

Using semi-structured elite interviews the researcher can exercise greater control over the progression of one interview to the next. The methodology therefore sought out a systematic approach. The linking of interview content can follow the logic of the interview questions, pursuing lines of inquiry to a point of redundancy where no new significant information is discovered. In an attempt to apply a conceptual framework the 'laddering' approach from marketing is investigated. In its original format it attempts to help an interviewee to articulate an answer by laying down a trail of questions. In this chapter, the thesis explores the approach as a way to establish a linking of questions across interviews in order to bring about a continuous line of inquiry across multiple interviewees. This is analogous to the original marketing purpose, though not a direct application of the method.

Imposing a system on the order of the interviews is often impeded by access problems. 'Snowballing' is discussed here as one method for maintaining a flow of

interview contacts since it taps into a network of contacts by asking an interviewee to make an introductions. It is well suited to qualitative research where statistical sampling is not relevant (Bryman, 2001) but its primary utility is in aiding the research to identify a series of contacts that were not previously known. This is not necessarily applicable to organisations which are led by identifiable members of the management team and it can often be a simple matter of discovering who they are from company literature or the mass media. This is particularly the case when the interviewees being sought are the most influential within the management teams. The following sub-sections will look at the status of interviewees, how the content of interviews can be developed across different settings by an adaptation of laddering and the manner in which interviewees can be identified.

2.3.1 Elite interviews

When a research programme seeks to uncover the foundations of the units of analysis it necessarily focuses on the key decision makers. As defined by Marshall and Rossman (1999, p.108) the interview embodies the fundamental aspects of qualitative research:

"The participant's perspective on the phenomenon of interest should unfold as the participant views it, not as the researcher views it."

In the matter of industry, the interview process lends itself to gathering a wide range of qualitative views from a variety of sources. The purpose here is to reveal the sweep of factors that impinge on a company operating in the contextual industry, not the minutiae of operational specifics. As such, the interest is in the key decision makers and their view of the issues facing them, not the practitioners of established processes. This requires a method that allows the participants to express themselves, as opposed to responding to specific questions, and this is best achieved in the interview format.

By focusing on key decision makers it is possible to gain an insight into a wider perspective, one that deals with the contextual considerations of the company and the industry. This yields data at a level appropriate to the issues being investigated. As Fitz and Halpin (1995) point out, a lot of research has been conducted to give a

'voice' to the disadvantaged, while the powerful in society have the personal resources to deflect individual attention. Those with power can be called the elite and elite interviews are intended to give them their voice. Fitz and Halpin (1995, p.67) conducted interviews focussing on education policy and there were four main objectives:

1. Interview policy makers to obtain additional insight into published policy documents.
2. Clarify existing published accounts and open a new narrative.
3. Identify networks of individuals.
4. Clarify the 'assumptive world' of policy makers.

The first two items are concerned with obtaining a different perspective in the interests of validation, while the third reveals the decision making framework. The fourth item can reveal hitherto unknown data because it allows the interviewees to state their priorities and the underlying issues. It should be noted that the interviewee's status is not of interest as such, it is the content of the interview that is being sought. Dexter (1970) prefers the term "non-standardised" to elite to differentiate it from orthodox interview situations in the following ways:

1. The interviewee defines the situation in question.
2. The interviewee structures their own account.
3. The interviewee decides what items have priority and relevance.

In a standardised interview the researcher has prepared the problem and is seeking answers to it, so the unique or illuminating view of the expert can produce anomalies that are difficult to deal with. Stanley Payne, for example, cautions that the presence of a specialist can skew the results in the direction of their view, either by direct influence on their fellow respondents or by statistical bias (Payne, 1951). Conversely, with a non-standardised interview the interviewee plays the role of teacher and it is their insight, no matter how unique, that is the point of interest.

Understanding the use of the term "non-standardised" also highlights the distinction that should be drawn between different types of elite: political and business sources.

Moyser and Wagstaffe (1987) devote the majority of the introduction to their book discussing the normative implications of researching elites in society since political leaders derive their mandate from the general population. Political elites represent the interests of those they lead while business elites represent the interests of the company. This is particularly pertinent to the issues of industry where the interests of production workers may be entirely at odds with concepts of firm structure. For such a study, the executive management, those with policy making powers or having intimate knowledge of it, are taken to be a self-contained elite with a formally defined scope of power. It is also assumed that the management adhere to a unified vision of the company and so can represent it, though not all to the same levels of authority.

Dexter contrasts the elite interviewee with the key informant whose status as a source of data is different. An informant is one who acts more as a proxy for the researcher, having access to information that can then be passed back as data and playing an important role as an addition to other sources. They can be taken to be individuals who hold information but lack the power to act on it, in other words, they do not have strategic control over the industry or companies but do have intimate knowledge of the issues. Such informants can include analysts, government agents, industry representatives and public relations personnel. The purpose of including such informants is to construct a contextual picture and triangulate the elite interviews by cross-referencing.

The elite interviewee needs to be given space within the interview in which to express these insights. When looking at how a company might need to shift its orientation to confront issues, the researcher should avoid putting a preconceived structure on the interview with planned questions. An elite interview is therefore able to capture anomalies, indeed this is often the *raison d'être* of the approach.

A problem with the elite interview comes from allowing the interviewee too much control over the interview process. Marshall and Rossman (1999) go so far as to warn that the interview may even be manipulated to the degree that it is turned back on the interviewer. Elite interviewees are often articulate individuals who welcome the chance for a verbal duel; Fitz and Halpin were particularly intimidated by such professional communicators during their research in education:

"What researchers confront therefore, is not simply the power of office, but power exercised in and through language and communication." (Fitz and Halpin, 1995, p.68.)

A recommended way to counter this is for the interviewer to be capable of shrewd questioning based on a deep knowledge of the subject. This can be achieved by dividing the data collection into two phases. The first involves basing the research questions on a thorough understanding of the issues published in the literature and devising proposed interview protocols which are then conducted on informants of peripheral interest. This could include elite-style interviews but with interviewees outside the companies under study. This prepares the ground for the second phase, the elite interviews themselves, by which time the interviewer has the skills and knowledge to tackle an elite interview at the centre of the case study.

The interview itself can be controlled by use of two techniques. The first concerns the degree of structure to the interview. There are two extremes to this, either structured or unstructured. Moyer and Wagstaffe (1987, p.18) make the claim that elite interviewing does not prescribe one technique but:

"...a whole family comprising varied alternatives."

This may be reasonable when discussing social science research which can take many forms, but in the case of company policy the range of research tools is significantly narrowed. This is because the interest is in the elite group as conveyors of information they have in their possession, not as a social phenomenon.

By implication, the elite interview obviates the use of a structured approach because the interviewee is the expert and to restrict them to answering prepared questions would negate the benefits of interviewing them in the first place. At the other extreme, the unstructured interview presents precisely the control problems that are pathological to the elite approach. The compromise is to use a semi-structured approach comprising open ended questions that facilitate and guide the interview process. The essence of this approach is to be flexible in the use of the questions, the respondent being free to answer to the depth they feel is suitable, avoiding questions

to which they are averse and even changing the order in which they are answered. Fitz and Halpin (1995) found that a printed sheet of questions could act as a prompt sheet during the course of the interview, and could also be sent to the interviewee in advance to allow them to visualise the overall shape of the interview, allowing them to prepare and prioritise their answers. The results of one interview could then inform the formulation of the next interview protocol with the topics appropriately amended.

2.3.2 Linking of interviews – by content

The process of one interview influencing the protocols of the next is one that can and should be formalised. However, as Dexter (1970) notes, unlike standardised interviews it is not possible to impose a mechanical method to structuring the schedule of elite interviews. This is particularly so when there is an exploratory element to the research and the data from one interview can be used to inform the next. The danger is that without a conceptual framework to this accumulation of data the path will have no coherent direction, each step being merely dictated by the one immediately preceding. At the same time, a prescribed approach would be too rigid for what is, in part, a self-generating research strategy. Since it is the case study that guides the search for data it will necessarily be that each research programme must adapt an existing theory to one suited to linking the content of the interviews as they develop in that specific case. One such candidate is the laddering technique, a system previously used for linking the data generated within a single interview rather than between successive interviews.

Reynolds and Gutman (1988) are major proponents of the laddering technique, a valuable tool in marketing research concerning personal values at the micro or psychological level. It is derived from the Means-End Chain model of consumer behaviour which assumes that choices are guided by values in the form of desired end states and that the diversity of products available for a choice decision is reduced by grouping them into sets (Gutman, 1982).

To make this fit a research interview concerning corporate strategies it is necessary to delete the plethora of products and consumer values, substituting firm strategies and management priorities. This stretches the Means-End Model beyond its design

parameters because its purpose is to uncover a covert and personal psychological process, whereas corporate strategic decisions are based on overt information searches. Of course, views are still being sought, but laddering was devised to help bring the respondent to an answer they would normally find difficult in articulating. An elite interview has the opposite problem in needing a method for managing the expertly articulated flow of responses.

Laddering is designed to provide a hierarchical value map, a type of cognitive map, by exposing the underlying personal motivations. Corporate strategy is based on objective information and it is the linkages that comprise a decision map that is of interest. Strictly, laddering is designed to elicit an answer from the respondent, while in elite interviews the interviewee is able to provide and structure the answer by their own volition. Yet laddering is still an attractive technique for managing an elite interview because it provides a template for progressively probing questions for a valuable result.

The derivation of the method is useful because laddering gives a systematic approach to building up the interview and providing the linkages that reveal the processes underpinning the corporate decisions. The concept can be extended further by using one interview to not only inform but also to build towards the next, in this sense laddering across interviews. In this way, any initial interviews are more than pilot studies for researcher familiarisation, they are an integral part of the entire research programme and are the first rungs on the laddering process. This enables discovery and exploration of themes across a variety of interviews to aid triangulation and the generalising of conclusions.

Reynolds and Gutman (1988) note two problems with the laddering approach, this being where the issues are too sensitive for the respondent to deal with or where the respondent does not have an answer to give. Sensitive issues in this research programme pertain to commercial confidentialities and so are more of an access problem rather than an obstacle to the course of the interview itself. Neither should there be difficulty in delivering an answer, the elite interviewee being articulate in either giving the answer or explaining why it is not in their remit to be able to give one. Despite this, there are limits to the loquacity of even the most articulate

respondent and so some of the various counter-methods suggested by the authors can still be employed to good effect. Six of these are listed, given here with their applications to elite interviews:

1. Evoking the situational context – suggesting an issue for discussion.
2. Postulating the absence – used to 'unblock' an answer, gaining perspective on an issue by suggesting the converse of it.
3. Negative laddering – reversal of orthodox laddering, e.g. "Why wouldn't you want to be independent?"
4. Age regression – an historical view, gaining perspective on current issues in comparison with the past.
5. Third person probe – comparison with the activities of other companies.
6. Redirecting – communication check by repeating responses for confirmation.

Again, since this research programme proposes using an adapted form of laddering, the interview techniques are being put to a different purpose. In consumer research they are needed for eliciting responses but here they are useful in gaining novel perspectives. It is these new perspectives that can then be carried across to the next view, creating links as part of a cohesive research design (see Chapter 3).

2.3.3 Linking of interviews – by respondent

At the planning stage of the research there are two questions concerning the collection of data: who to interview and what should be the sequence of the interviews. In practice, difficulties of access will work against such a neat plan and this creates two further problems: how to identify possible subjects and how to gain access.

'Snowballing' is one procedure for identifying potential subjects. According to Faugier and Sargeant (1997) the generic term is link-tracing but the commonly used technique is known as snowball sampling. This is where one subject proposes the next in order for the research to gain access to subjects that would not, ordinarily, be available. The authors acknowledge that this introduces sampling bias due to the

deliberate selection of subjects but it also comes with an in-built validity check as the subjects can reinforce each other. Indeed, Etter and Perneger (2000) compared snowballing with random sampling for research on smoking and found little evidence for bias in snowballing.

In any event, snowballing is not a necessary feature of research based on elite interviews. Elites are by their nature highly visible, often quoted in the media and their influence thereby easily inferred. Galaskiewicz (1987) found that a magazine and newspaper search was an effective way of becoming sensitised to the target elite. This provides the coherent path to the interview schedule, one that would, if anything, be thrown off course if snowballing were the primary linking mechanism.

Identification is not, though, a guarantee of accessibility. Brannen (1987) notes that gaining access is a political process and so took the top-down approach. This meant gaining access to the chairman first and then using that success as leverage to progressively access those further down the hierarchy. This is a high risk approach which can founder on an initial failure, a lower risk approach being to search for any initial access and then follow that line of enquiry up as far as the data trail will go. Once exhausted, another line of enquiry can be commenced, though a top-down approach can be used concurrently as a supporting method.

Thomas (1995, p.4) found that:

"...business elites are quite good at insulating themselves from unwanted disturbance".

The author goes on to warn that the first line of defence for an executive is comprised of the company gatekeepers, posted to monitor the activities of outsiders. These are often official spokespersons or representatives. Gatekeepers can be helpful in passing the researcher to the most appropriate subjects, particularly when their own status is seen to be enhanced by this, but they can also jealously guard their contacts if they think the research may be a threat to their own position. When this happens they can present a serious obstacle that may have to be circumvented. Dexter (1970) was able on one occasion to find a higher authority to represent his interests to the gatekeeper

and so reverse the gatekeeper's earlier obstinacy. An alternative is to simply contact the target subject directly. Thomas (1995) does not support this and recommends finding an intermediary with personal contacts in the company, or making direct contact with sympathetic non-elite staff at the company who can then represent the researcher's request to the target elite. Whatever the approach being made, without a gatekeeper the researcher is left with little option but that of simple 'cold calling'.

When contact is granted with the target subject, preparation is essential. Thomas (1995) recommends that the initial contact should be personalised in three ways:

1. Promote the subject's view as being of intrinsic value, avoiding being passed on to another.
2. Express the value of the subject's view as a source of knowledge.
3. Define the nature of the problem in specific terms.

Dexter (1970) cautions against giving too much detail in the initial contact, since that encourages the target subject to pass the enquiry on to a specialist, and emphasises that the request should appear relevant to the subject's area of expertise. This also entails having some understanding of the subject's work practice and how an interview can be conveniently accommodated by them. Thomas (1995) adds that this is not simply good manners as elite subjects tend to put a high value on their time.

Once the first interview has been successfully completed a recommendation can be sought to the next subject, on opportunity to make use of snowball sampling although here it is a way of gaining access to a target subject already identified. Galaskiwicz (1987) formalises this into the reputational method where interviewees were asked to rate the reputations or influence of other interview subjects, though this function is partially satisfied in the corporate structure by the hierarchical status of the interviewee. The building of a contact network also imposes a structure on the data gathering because the easiest contacts will come first, progressively building towards the most influential of the elite in the higher echelons of the hierarchy. Retired executives can provide particularly fertile ground for this since they offer greater accessibility and they may recommend contacts still employed by the company.

There are problems in relying on sympathetic subjects representing the researcher's interests. Much of the research that uses elite interviews has been in the field of political science, and researchers warn against the pollution of one source by another. Dexter (1970) gives the example of an unpopular union leader, many times passed over for promotion, who "threatened" to adopt the author as a *protégé*. This would have had a disastrous effect on the gaining of future contacts and could have been as deleterious as an obstructive gatekeeper. To a lesser extent, the interviewee may have a tangential role to the main thrust of the company's policies or that they may "talk up" their contributions. Such digressions can be countered by firstly relying on recommendations and secondly by cross-referencing interviews for triangulation. This allows the researcher to increase the scope of interviews conducted and include those outside the subject companies without compromising validity.

2.3.4 Data recording and coding

The major challenge of any interviewing technique is extracting the data in a form that is ready for analysis. In order to link the analysis to the original data an appropriate recording method should be used, one that captures the richness of the information gathered without compromising the interview itself.

Simple note taking is presumed to be a non-invasive form of data recording, it being possible to take notes during a break in the conversation, or even during it if the interviewer has the necessary skills. This method is also particularly suited to interviews that focus on the content, where it is information that is being gathered rather than the process of the interview being studied. Dexter (1970), from experience, considered it rarely worth using a tape recorder and considered them invasive, but relented in view of the need to capture the interactions between interlocutors. The author's point about the high costs of transcribing the interviews remains apposite, but it should be noted that the latest technology is more discrete and therefore less invasive.

Corbetta (2003, p.280) takes a more supportive view, perhaps reflecting the technological improvement. The author warns against a written summary during the course of the interview:

"...as the result would be incomplete, dull or even incomprehensible".

A written summary does not preserve the original content of the interview, and the author even exhorts researchers to transcribe idiosyncrasies of speech, such as dialect or errors. This is appropriate to social research questions where the form of the interview is of interest, but for a content driven interview the advantage of a full transcription is that the data can be interrogated for additional data. It has been shown how one interview can inform the next, but with a complete transcription it is then possible to return to previous interviews to uncover material that may not have seemed important at the time. Contrary to this, a written summary only records what was judged important at that time and unwittingly discards potentially valuable material.

This does not contradict the view of Dexter (1970) that transcriptions are costly in time, putting forward a figure of nine hours transcription to one hour of tape, but if it is the researcher who transcribes then it is more than a mechanical process of converting the verbal to the written. Indeed, transcription presents another opportunity to re-engage with the interviewee, albeit passively. This does not so much unveil subtleties in the form of the replies, as might be useful in social research, but content information can be recovered that might not have been pursued at the time of the interview. A written summary would miss the same information but recovery would depend on a spontaneous recollection by the researcher after an extended period. This hardly denotes reliable recording of data.

An additional time cost comes with the need to code the data for analysis, yet this too is a chance to revisit the data. It also means that the judgment on what data should be omitted can be left until late in the fieldwork phase, or all the data can be coded at the same time to enhance the uniformity of the coding process. Having already completed several iterations of the data, courtesy of the transcription process, codes can be used to reflect the themes that have emerged throughout the entire data set.

2.4 Validity, reliability and generalisability

However impeccably a research strategy may have been devised, ultimately it must first show validity by measuring what it set out to, then do it reliably to show the data was not arrived at by chance, and finally prove its utility by having the potential to be generalised beyond the subject of the case. It is by confronting the demands of validity, reliability and generalisability that a research programme shows its value. The three factors are as relevant to qualitative as much as to quantitative research, but the manner in which they are dealt with is quite distinct. While quantitative data can be set against formal, statistical standards, the qualitative study cannot always rely on external corroboration. Dey (1993, p.221) even says:

"...the qualitative analyst may have to play all the roles in the analytic drama."

Thus the onus is often on the researcher to organise the data so that it is mutually evaluating. The key characteristic of a qualitative case study is the revealing of the complexity of the case. In recognising this, triangulation can be used to regulate the data by introducing an element of cross-referencing. The very process of exploring and revealing the richness of the data serves to reinforce its value. Triangulation is not a formal process, despite the term it does not prescribe necessarily the use of three sources for every datum, but it does involve cross-checking of the data.

2.4.1 Reliability

Corbetta (2003) states that reliability is concerned with the stability of the results over time, and yet any study involving human interaction will show the same variability as the participants. Quite simply, it is not possible to retest people and get the same result. This is particularly exacerbated in a qualitative study where the very process of articulating information in one interview may lead the subject to revise their position in the next meeting. Corbetta refers instead to equivalence, a correlation between results. This can be effectively addressed by confining the interviews to the same topics, even if the specific questions are an integral part of the each interview. In developing the coverage of the topic, as would happen in an exploratory phase, a good

correlation would be expected between successive interviews, though not ultimately between the first and last. This means that correlation of data is conducted tactically rather than strategically. Naturally, this correlation could not be expressed quantitatively so it is the purpose of the data analysis to pick it out and demonstrate it by juxtaposition of sources.

Dey (1993) feels that without the possibility that the research will be replicated then presentation of corroborating data is not credible support for reliability. Since very few are replicated, it being impractical for a different research programme to put the same interview questions to the same case study participants, support for reliability must be found elsewhere. He illustrates this with the analogy of a watch that the wearer does not want to subject to testing, so assurances of reliability are given by explaining the mechanism. Similarly, by meticulous description of methodology, Dey claims that the trust of the scientific community might be engaged. If this suggests that faith is needed for the research design to be accepted then Miles and Huberman (1994, p.278) suggest that the reader should actively question the design as it is revealed.

2.4.2 Internal validity

Internal validity is of particular importance to the case study design because as a bounded system it must primarily be true to itself. For Miles and Huberman (1994) internal validity is simply a question of truth value, whether the findings are faithfully linked to the data. At the most basic level it might be asked whether the case selected actually is representative of what the researcher claimed to be investigating. Denscombe (1998) further cautions that because the researcher is in close proximity with the case this can lead to "observer effect" where those being observed act differently to how they would normally. These mutually exclusive views, a negligent selection of the case or a misrepresentation of the data by the participants, both delink the empirical data from the findings. It is quite possible that interviewees at the case studies might unwittingly misrepresent their companies, by understating the nature of the challenges or overstating the achievements. The multiple case study design is intended to neutralise this by comparing the data from various companies, and

triangulation enhanced by including interviews taken in the contextual industry and institutions.

Corbetta (2003) gives a more specific warning concerning content validity, that of whether the full range of meanings for a concept is fully defined. Even when the general research questions have been stated there may be disagreement over the meaning of the terms involved. In a semi-structured interview this problem can be turned round by presenting it to the respondents for discussion. In this format the interviewee has some leeway in applying the emphasis that they perceive as suitable, so in combination with other respondents a more comprehensive picture of the concept might be constructed.

2.4.3 External validity and generalisability

External validity is perceived as a critical weakness of the case study research strategy as it relates to the generalisability of the study. Indeed, it is in this area that it has to justify its wider utility. It is a peculiar problem of case studies because the context of the case is the external, so it is important that the methodology takes account of the validity of the link. De Vaus (2001) notes that collection and analysis of data must be guided by theory on how the case fits with its context. The theory then defines the external validity of the case study. The author presents two kinds of case study, explanatory and descriptive. The role of theory in a descriptive case is of lesser importance, while explanatory case studies present opportunities for theory testing or theory building.

Yin (1994, p.30) also puts deductive theory testing at the centre of case studies and calls this analytic generalisation, in contrast to statistical generalisation. Statistical methods allow a Level One Inference by appeal to formulaic confidence levels, which is not open to case studies because they are not sampling units. Instead, the external validity of a case study is analogous to Level Two Inference. This encourages the researcher to seek the representative case that will illuminate the understanding of the theory. The theory that guides the researcher has arisen from the generalisation of a previous study, but if the theory is confirmed by the data it cannot strictly speaking be said to be proven, only supported. In a research programme, the theory might arise

from an inductive review of the literature so that it can then form the basis of the fieldwork.

Stake (1995) claims that generalisations are possible even from single cases, though they are not as robust as those from multiple cases. In a later publication (1998), the author warns that a case study is but a small step towards a grand generalisation and that the researcher should not be tempted away from the essential features of the case to create clear but unsupported theories. Whether supported or not, refining the theory with case studies is an open ended affair and additional cases may be amassed and the theory refined. This leads to theory building where subsequent cases can be chosen for their capability to further illuminate the original propositions by recognising the differences and commonalities of the various cases. If multiple cases are researched in parallel then a degree of replication might be achieved, with even greater robustness if they support the new theory but not a rival one (Yin 1994).

Corbetta (2003) looks at the taxonomy of external validity. The author states that criterion-related validity links the indicator to the concept, for example the interview data to other observations. In practice, as Corbetta states, since this validity is not measurable it is the correlation between two indicators, not strictly that between the indicator and its concept. Corbetta eases this task by sub-dividing criterion-related validity into predictive and concurrent validity. Predictive validity is the most impressive test of validity, the potential for the case study findings to illuminate the future, but commercial activities rarely progress with identifiable steps. At worst, the exogenous shocks may force a new strategy on the case study company, or it might even cease trading altogether.

Concurrent validity releases the research from being held hostage to the future by taking comparable data simultaneously. This supports the research strategy of using multiple case studies because the same topics are being addressed across the case studies, albeit from different perspectives. By taking comparable data at the same time the state of one case might suggest a future state of the other. This, then, imports an element of predictive validity. In addition to this, the approach includes the notion of replication described by Yin (1994).

In recognising that external validity has a particular role to play in the richness and complexity of case study research, the part of the researcher should also be acknowledged. The case can only be known through the researcher and this causes problems for validity. Construct validity, therefore, addresses the accusation of personal subjectivity to which case study research is vulnerable. The researcher needs to show that the data reported is salient and not minor material that happened to appeal to the researcher personally. This recalls a defining feature of case studies, the richness of the data, which complicates the research process and yet also provides mutually supporting data. It is by thoroughly investigating and presenting this that the researcher is able to deal with the various problems of internal and external validity.

2.5 Ethical concerns

Authors such as Marshall and Rossman (1999) discuss the importance of ethical considerations in social research when it impinges on sensitive or illegal activities. They say the researcher faces a complex dilemma:

"Is the researcher's primary responsibility to the research task, to those being observed, to those assisting with the observation, or to society as a whole?" (p.93.)

Although this is rather a broad perspective, in company research there is a need to both respect commercial sensitivities and maintain the confidence of sources in order to facilitate the progress of the fieldwork. As case study research looks at the subject of the research *in situ* it places the researcher in an unusual position:

"Qualitative researchers are guests in the private spaces of the world. Their manners should be good and their code of ethics strict." (Stake, 2003, p.154.)

Punch (2005) categorises the literature on ethics into two types: there are the prescriptive guidelines put out by institutional bodies, and then there are the historical accounts of issues arising during research from which lessons may be learnt. There is no reason why a prescriptive guide should not apply to a case study strategy, but it is dependent upon the design of that study. If the methodology were using psychological

testing then it would be appropriate to refer to guidelines put out by an organisation such as the British Psychological Society (BPS). The BPS publishes general guidelines for research on humans, which set out broad areas of concern (British Psychological Society, 1992):

1. Deception – the distinction between withholding information as part of the study and deliberately falsifying the purpose.
2. Debriefing – releasing the participant from mental anxiety.
3. Risk – protecting the participant from unreasonable hazard.

Laudable though it is to propose guidelines, even these generic principles require adapting to research in the commercial world where the informant's personality is not the focus. Here the ethical standards do not have the same moral foundation, they pertain more to the smooth running of the research. In exploratory fieldwork there is unlikely to be deception on the part of the researcher since it is the participant who has the knowledge, and any subsequent debriefing would be to allay the researcher's confusion rather than the mental anguish of the participant. Risk is an issue, but it is more open ended: the risk that a confidence might be broken by the researcher, putting the participant's career in danger.

Punch (2005) instead allows the researcher to appeal to the experience of previous studies for support if formal guidelines are unsuitable. As Merriam (1988) points out, because case studies are emergent designs it is difficult to anticipate where the research will lead and thus what ethical dilemmas might arise. Problems might continue to the publication stage where it is necessary to identify the case because it is the case's peculiarities that are of interest, yet at the same time acknowledge that confidentialities might have to be observed or identities veiled. Ryen (2004), therefore, discards the prescriptive approach and looks at the three main ethical issues that face a research programme. The first concerns codes and consent, specifically informed consent, so that the participants agree to the research design as it relates to them. We can suggest that this could be fulfilled by initial contact with the participant containing information on the style of the interview, the topics that will be raised and how the data will be used. Post-interview this could be followed-up with a courtesy letter of thanks and a review of how the data has advanced the research. Ryen's

second ethical issue, confidentiality, can be confronted at the same time by offering to agree to formal confidentiality before the interview and stating how the respondent is to be identified in the research report. If these two issues are satisfactory to the participant then the third ethical issue, trust, can also be resolved. It is behoven upon the researcher to leave a good impression on the participants so as to facilitate the course of subsequent research.

It seems, then, that although a set of prescriptive ethical rules can be applied to a case study research programme there are nevertheless issues, such as Ryen suggests, that should be accounted for. Just as the units of analysis lead the researcher to the appropriate research design, so they can also direct the research to the appropriate ethical measures. If a company is the unit of analysis, then the phases of the research where ethical concerns might arise can be categorised as:

1. Access to the company.
2. Data collection process – interviews.
3. Publication of the research.

In the first phase, the research is at the mercy of the goodwill of the company so the ethical issues are concerned with the research programme and its approach to the company. Reference could be made to the BPS advice on deception when setting out how the fieldwork proposal is formulated, including the structure of the data gathering and its aims. It is also necessary to observe rules of etiquette which, though not strictly within the field of ethics, colour the impression the research makes on the organisation.

In the second phase the ethical concerns are with both the researcher and the respondent, although the respondent might not specify their nature. For example the respondent might be concerned about professional reputation or the confidentiality of the information and this would inhibit the transfer of data. At the same time, in a multiple case study design, the researcher must be cautious about quoting data from one company to another, though there is nothing unethical about this in principle.

For the final phase, the ethical responsibilities pertaining to publication are entirely with the researcher. If confidences are broken at this stage it is unlikely to have a deleterious effect on the research programme as it stands, but may adversely affect subsequent studies. The professional reputation of academic research should be maintained in order that the future of research in the field might be secure.

The overriding approach to dealing with the ethical issues arising from the three phases is to neutralise them before they appear. When it is acknowledged that case study research is, in the words of Merriam (1988), an emergent design, then it should also be acknowledged that ethical problems will arise during the course of the research connected with the situations to which they are attached. Just as the research design creates a framework for the data to become known, so careful planning can reduce the potential for ethical difficulties. This should be done by involving the participants in the research design so that they are aware of how the study is expected to progress, the instruments of this being clear statements of intent and offers to discuss concerns that the participants might have. In this way the overt and emergent ethical issues that are unique to the case study can be brought into relief and dealt with to mutual satisfaction.

2.6 Foundation for research design

The purpose of the foregoing discussion on methodology has been to present and discuss the basis of the approaches taken to this research programme. Although a study of this kind on company structure seems to lend itself to the case study approach this does not absolve it from rigorous justification. The research questions play a role in this by indicating the appropriate units of analysis and the methods by which they may be evaluated. The research questions also indicate whether the research design should be orientated towards quantitative or qualitative approaches. These can both be contained within the case study strategy and this chapter has shown how the case study approach provides a framework within which a coherent investigation may be conducted. In essence, the research questions posed in this thesis form the foundation of the programme and as such precede the research design, the following theoretical concepts and the empirical data.

This chapter has not taken into account the unique aspects of this research programme, so it has not evaluated the aspects specific to the research design that was put in place. The next chapter, Chapter 3, will demonstrate how this final research design was implemented. It is from the base established in this chapter that the details of the research design may be defined, and these will be presented in the next chapter of the thesis.

3: Research Design

While the previous chapter established the methodological foundation to the research strategy, this chapter is concerned with the practicalities of the data collection. The case study design will be described along with the selection of candidate companies. Although ultimately the case study focuses on a single company, the industrial context is made up of many other companies operating under the same conditions. The context can be further enhanced by appeal to other sources connected to the industry but not directly involved in the companies comprising it.

This chapter will also lay out the progress of the research programme in order to show the full structure of the data collection. The data itself will be utilised and analysed in the subsequent chapters to which it is related, while some of the research material will be made available in the appendices to the thesis.

3.1 Qualitative case study

The purpose of this research programme has been to investigate the scale and integration characteristics of an automobile company. Although the interview protocols were concerned with detailed questions, the overall research questions focused on three broad areas:

1. Automobile company size according to technical efficiencies.
2. Automobile company organisational structure.
3. The degree of latitude in achieving the theoretically determined size and structure (i.e. the potential for approximating to the most competitive size and structure).

As discussed previously in sub-section 2.1.2, a study is qualitative or quantitative depending on the treatment of the data rather than the nature of the data itself. In this thesis the data sourced from the literature are used in an emergent fashion (Creswell,

2003) to define the limits of company size and structure, with the empirical evidence bringing wider contextual data. The interviews, in accordance with Lee (1999), permit those who are influential in the industry to bring their own interpretation to the problems posed by the research questions.

Although technical efficiency of production is itself a quantitative problem, its treatment in this research programme is essentially qualitative since the precise differences between different production sites cannot be accurately quantified but they can be explained and comprehended. Relative technical efficiencies therefore tend to be based on expert judgement rather than precise measured quantities. Company structure considerations would also be difficult to quantify given the inclusion of economic concepts of opportunism and global factor endowment differentiation. This does not mean that the quantities do not exist but that it would be difficult to define *a priori* what dimensions they should take. For example, if quantitative analysis found that a small company (eg. Porsche) was making high financial returns on low production output then the study would conclude that mass market manufacturers should follow the same pattern. Qualitative analysis based on the judgement of knowledgeable interviewees would, however, find that such a company was dependent upon a successful cost recovery pricing as part of its prestige image and thus not an option available to mass market manufacturers. The qualitative approach is therefore more suited to the building of a multi-dimensional theoretical model because it can use input from experts to interpret the numerous perspectives.

Miles (1979) embraces this complexity when putting forward the "goal-system state analysis" where the means for achieving a target, such as company size and structure, can be multifaceted. This lends itself to the qualitative approach where the research can infer causality based on the data collected in interviews. This was often expressed in the interviews with "What if..." style questions to elicit responses that would illustrate the range of options available within the industry. Naturally, only semi-structured interviews could include such flexibility within a systematic study. Indeed, the case study company presented a series of possible scenarios which were then discussed during interviews at MG Rover. The next section of the thesis will look at the selection of MG Rover as the case study that is apposite to the research questions.

3.2 Selection of the case study company

The subject of this case study, MG Rover, was chosen for its ability to exemplify the issues facing automobile manufacturers within the industry. The choice among UK companies was severely limited by the fact that, of the few independent manufacturers left, at the time this thesis was commenced in 2001 only MG Rover operated as a volume producer. Moreover, it was only by pure serendipity that it was independent at all, having being sold by the previous owners, German car producer BMW, to Phoenix Venture Holdings in 2000.

Other potential case study subjects might have become available by looking outside the UK. The last full year of MG Rover production was 2004 when around 108,000 vehicles were produced (Automotive News, 2006b). At this level of output, most other manufacturers were either protected (eg. by government decree) or were engaged in licensed production of models developed by other companies. The next largest company in terms of annual output that was both integrated and fully exposed to global competition was Porsche but it is not a mass market manufacturer, which means that it is not fully committed to the mass production technology, and in any case its second largest selling model was a joint venture with VW for an SUV.

MG Rover production reached a peak of 147,000 units in 2002 (Automotive News, 2005f), at a time when this research programme was firmly established. Then, the next highest integrated manufacturer was SsangYong Motor with a little over 160,000 units produced. That company, though, specialised in SUVs, which are not customarily made according to the mass market passenger car production technology. Table 3.1 shows a selection of the companies that most closely resembled MG Rover in 2002, demonstrating scale in terms of output and degree of vertical integration.

Table 3.1 Range of potential alternative cases to MG Rover

Company	Output	Vertical Integration
Lancia, Italy	105,297	Fiat Group dependent Shared platforms Shared engines
Proton, Malaysia	237,024	Government dependent
Saab, Sweden	124,892	GM dependent GM platforms GM engines

Sources: Automotive News (2004f)
OICA (2006)

From Table 3.1 it is clear that there are few automobile companies that are sustainable near the level of output MG Rover temporarily achieved in 2002, or even the 200,000 annual output the company targeted. Those manufacturers that are using the same mass market automobile production technology with these quantities of output are doing so as part of larger groups. Lancia of Italy is dependent upon Fiat for the basic vehicle architecture and the powertrains. Proton strongly resembles MG Rover in terms of output and product characteristics, yet even though it is independent of other manufacturers it benefits from material government support. Saab had a similar level of output to MG Rover but its two models are solely in the executive segment and, although it had a measure of autonomy within General Motors (GM), this element of independence has now been lost. Other vehicle manufacturers that appear to have comparable production, such as AutoGaz of Russia with 2002 production of 198,135 (Automotive News, 2004f), have not been included since they are not using the same production technology. Indeed, AutoGaz specialise in commercial vehicles, as do most of the Chinese producers at a similar output level.

Mazda was an attractive proposition as a prospective case study company since it had a similar range of products to MG Rover; its MX5 sports car is often cited as the spiritual successor to MG's MGB. The problem in using Mazda as an alternative case was whether it could be considered independent or not. Ford bought a 24.5 per cent share in the company in 1979, representing a strategic investment rather than an attempt at control. The two companies have cooperated on various occasions, such as assembly of the Ford Probe sports car and the establishment of the Korean company

Kia Motors in 1985, but Mazda retained an autonomous product plan and innovative engine design (e.g. rotary and Miller Cycle engines). In 1996 Ford increased its ownership to 33.4 per cent (Mazda, 2004) and now counts Mazda as one of its brands (Ford, 2004). Furthermore, production by Mazda was far in excess of anything achieved by MG Rover, amounting to 773,798 in 2002 (Automotive News, 2004f). Mazda was thereby rejected as a valid alternative to MG Rover on the grounds of its lack of independence and being far larger.

In 2002, all the mass market automobile manufacturers that could claim to be independent and vertically integrated enjoyed annual production above 1 million units a year. This ranged from GM with 8,277,000 units, though many of them would have been sports utility vehicles (SUVs) based on commercial vehicle platforms, down to BMW with 1,090,258 units, a minority proportion of which were also SUVs (Automotive News, 2004f). Companies of this size also tend to be globally dispersed. This meant that they would not have contrasted sufficiently from the proposed theorectical model to unequivocally falsify it. MG Rover was not only operating far below the scale accepted as the industry standard, but its main corporate functions were also tightly integrated on one site. The fact that, as a UK based company, it offered easier access was merely a bonus.

The resultant research owes its design to Yin's multiple case embedded case study quadrant of the 2×2 matrix. The embedded units of analysis are represented by investigations into scale and integration of different company functions. The different companies in the research are each separate cases but with the main emphasis on MG Rover as the one most likely to test the limits of the proposed theoretical model. The remaining companies therefore provided the contextual background, revealing the prevailing norms in the industry and providing support for the model. Research resources were particularly focussed on Honda as a contextual case since the company had, at one time, been closely allied to British Leyland and the Rover Group, the predecessors of MG Rover. This provided an opportunity to make comparisons between two cases that had shared a strategy from which they had since diverged. This suggested that one, or even both, of the companies had also diverged from the industry norms of scale and integration. The remaining contextual data was gathered

from other automobile manufacturers as well as external sources closely involved in the industry.

3.3 Company access

Over the two year period that the fieldwork encompassed, access problems fluctuated. Starting with no established contacts with any of the target subjects, a basic procedure was used to gain access to potential informants. This was conducted in three successive stages:

- Identification of potential subjects – from media interviews, citations
- Correspondence by letter
- Arrangement of interview

3.3.1 Case study access – MG Rover

This three-phase approach evolved after experiencing a failure to maintain access with MG Rover once initial contact had been made with the company's education co-ordinator who headed the Education Partnership, a division of the company that interacted with educational institutions. This was useful in gaining access to a tour of the factory by joining a school group and it was thought that this would be a precursor to deeper contact throughout the company. Although the risk of failure was heightened by the dependency on this gatekeeper, her role as a specialist in liaising with educational institutions was expected to mitigate it. This proved incorrect as the gatekeeper felt uncomfortable making introductions at higher management levels and further contact through this avenue was precluded.

Fortunately, at the time the research was being conducted, MG Rover was receiving extensive exposure in the media and certain personnel could be easily identified from interviews. The first of these was the PR representative, Mr Stewart McKee, Head of International Media Relations Sales and Marketing, and although he could also have become a restrictive gatekeeper he was found to be more sympathetic to independent

researcher contact with management. Contact was then made with Dr Chris Millard, head of strategy, and later Mr Rob Oldaker, director of product development. All three were identified first from the media and then contacted by letter (see Appendix 3 for McKee introductory letter). Having established a good relationship with the company, other interviewees were identified from the company's media website once the required password entry requirements had been granted. As before, each approach was followed by a letter of introduction.

This approach, however, was not suitable for interviewees who had retired from the company. There were three of these in the study: Mr John Bacchus, ex-BL director, was discovered after a speculative letter to British Motor Industry Heritage Trust at Gaydon where he happened to work part-time, and from that interview an introduction was made to Mr Peter Woods and Mr Malcolm Harbour, also ex-BL directors. Mr Bacchus and Mr Woods had also been intimately involved in the relationship between BL and Honda. In each case, as before, an introductory letter was used seeking an interview.

3.3.2 Contextual industry access

In order to form an understanding of MG Rover's industrial environment the research included contextual companies and institutions. To make this understanding as comprehensive as possible, this included a wide range of automobile firms in the UK and Japan. The research in Japan permitted a broad view of the global industry while exploiting this researcher's capabilities with the Japanese language and culture.

Due to Honda's close involvement with MG Rover's predecessors, BL and Rover Group, the Japanese company was targeted as a key provider of contextual information. Honda has no education specialist and the company does not entertain the same intensity of public exposure. A speculative letter was written to Honda Motor Europe in the UK which was passed on to Mr Chris Rogers, Head of Corporate Affairs, PR Division. Although an interview with him was not immediately secured, regular correspondence was maintained until he made an introduction to the director of PR for Honda Motor Europe, Mr Takeshi Sumita. First contact with Honda Japan was made by accessing the media website, sending emails to a selection of PR

representatives and receiving a reply from Mr Tatsuya Iida. Since this introduction was expedited more quickly than that with Honda Europe, this interview took place before that with Mr Sumita, though the contact with Honda Europe had been made earlier. Subsequent interviewees were identified from the media website and approached in the established manner.

Other contextual interviews were arranged in a slightly more *ad hoc* approach. Institutions such as the Japan Automobile Manufacturers Association (JAMA), the Japanese Ministry of Economy, Trade and Industry (METI), Mitsubishi Research Institute (MRI) and the UK's Society of Motor Manufacturers and Traders (SMMT) were contacted with speculative letters and a correspondence established with the representative to which the request was then referred. This was because specific contact details had not been initially available. Car company personnel were identified from the media as before, though Mr David Bloom of Jaguar, Japan, was introduced by Mr Wood of Rover Group, and from Mr Bloom an introduction was made to Mr Anthony Millington of ACEA in the style of snowball sampling. Although contact details for Mr Millington were not specifically available, the use by his organisation of standardised email address formats meant that his details could be discovered by simple trial and error with email addresses. There was one introduction made by an academic at Cardiff Business School, this was to Professor Shiromi Shioji of Kyoto University, but this then led to introductions with Professors Yasuo Sugiyama and Tsutomu Demizu.

The letters requesting interviews were all of the same basic type (see Appendix 3), unless including additional gratitude for the role of an intermediary. The letter summarised the purpose of the research programme and how the interviewee would be able to contribute to it. Confidentiality was assured along with a statement that the purpose of the project was intended to benefit the business community in general (see Appendix 11, letter to Chris Millard). Letters to Japanese contacts further emphasised the mutual promotion of international understanding, it being known from personal experience that these are concerns to which the Japanese tend to be sensitive. The correspondence continued after the interviews with letters of thanks.

3.3.3 Access hold-ups

There were two major problems in gaining access, both concerning hold-ups created by the gatekeepers. The first, with MG Rover's educational representative, has already been described and this was circumvented by repeated independent efforts at new contacts. The second hold-up was very similar, caused by Mr Iida of Honda, who gave one very hospitable interview but when the second field trip to Japan had been arranged he announced that no more interviews at Honda would be granted. This was a serious setback since he was in a much more commanding position than MG Rover's education representative. While Mr Iida might not have been responsible for granting permission for interviews he could have made further contact with personnel very difficult.

The tactic to solve this problem was to identify the CEO of Honda from media sources and appeal to him directly. This appeal was made in a diplomatic form, containing effusive praise of Mr Iida and stressing the role of the research in helping Honda promote international understanding. The expectation was that the current CEO would not have time to be interviewed in person but that he would encourage Mr Iida to continue aiding the research, simultaneously putting pressure on Mr Iida to cooperate whilst also enhancing his reputation with his superiors. It was thought that discretion was the most effective way of solving a difficult situation without putting Mr Iida in an invidious position. It transpired, however, that the person identified as the CEO of Honda, Mr Hiroyuki Yoshino, had retired six months previously, but this had the advantage that he was available for interview after all. It was likely that the diplomatic move was entirely successful since Mr Iida gave another lengthy interview and was present during the interview with Mr Yoshino.

There were few such critical problems with the other contextual interviews since they were not, on an individual basis, as central to the research as the company interviews. For example, though the interview at Morgan was useful it could have been replaced with one at, say, TVR, a similar scale of operation. Moreover, a refusal that precluded further interviews at such an organisation was never a fatal setback because depth of this kind was not being sought. In any event, refusals were rare, the only notable one being Sir Michael Edwardes, the retired president of British Leyland who had

presided over the early years of the joint venture with Honda. This was not considered an important omission to the data, other sources being quite capable of covering the same historical perspective.

3.4 Other documented information

In the course of collecting interview data other documented material, internet based information and letters became available and these have been cited as applicable in the same manner as other literary sources. Such information was not collected systematically but was requested at all interviews, being obtained in an *ad hoc* manner.

MG Rover was not a fertile source of additional data; as a recently independent private company it appeared to be fairly conservative in publishing its own information. Access was granted to the media website and it was a useful source of contact details, though the company appeared to be using this mostly as a marketing tool. Some historical documents concerned with BL and Rover Group are in the public domain, such as government reports, and even if their relevance to MG Rover was tangential they have been quoted where appropriate. After the data gathering phase of the research, letters of thanks elicited two responses of material interest from Mr Oldaker, a letter and an email.

Honda publish literature such as an annual FactBook comprising a *précis* of output data and historical background. It also allowed access to the company's media website which, during the early part of the research programme, was found to be a valuable source of diverse material. The company rationalised the website sometime in 2004 whereupon it became little more useful in content than the MG Rover site. Fortunately, the company also publishes books celebrating its successes and although a certain amount of company bias appears in the form of quasi-slogans and even hubris (e.g. "we call it the art of living, the Honda way" Honda, 1999, p.296) the publications were a useful source of information on the company philosophy, historical background, anecdotes and numerical data.

Documented information from the other contextual fieldwork was of considerable utility. Aston Martin provided figures that showed the rise in output under the patronage of Ford and compared this with Fiat's acquisition of Ferrari (see Appendix 6). Other companies were keen to promote their environmental concerns, the visit to Mazda yielded no interviews but plenty of information on this subject along with financial reports. Environmental sensibilities were also advertised in this way by Toyota and Honda, although the interviews did not focus on this as it was not within the remit of the study. Institutions such as the SMMT and the European Automobile Manufacturers Association (ACEA) in Japan were a useful source of data on industry trends, independent of the manufacturers. This was further enhanced by data from the trade unions Amicus and the TGWU, although these were not of the highest quality and even contained a large number of typographical errors on occasion. The trade unions in Japan were not contacted, in part due to their reputation of being more enterprise based and therefore biased towards the company, but also because the British unions were unable to make an introduction. Instead, METI provided publications on the Japanese automotive industry and its expansion overseas which the UK's Department of Trade and Industry (DTI) did not make available, though the SMMT partially filled this role. There was little in the way of useful correspondence from the contextual sources, although Mr Mark Aston of Morgan sent a brief letter of some interest.

3.5 Triangulation

Triangulation is a metaphor referring to the use in navigation of three back bearings from known points in the distance. The three lines drawn back from the known points cross each other at a point that then denotes the position of the navigator. In theory the intersection of two lines only are necessary, but in practice the presence of errors means that the third line acts as an additional check on the position. This is an apt description of the way that different data collection methods are used in qualitative research to illuminate the same concept, the contrasting lines of inquiry converging on the same conclusion. For example:

"...organizational researchers can improve the accuracy of their judgements by collecting different kinds of data bearing on the same phenomenon." (Jick, 1979, p.602)

The navigation metaphor should not be taken too literally, however, since the number of enquiries and the manner in which they are conducted is not pre-determined. Indeed, for any kind of triangulation there may only be two independent approaches being made. Denzin (1978) gives four types of triangulation:

- Triangulation of data – various data drawn from different sources or times.
- Investigator triangulation – input by various researchers.
- Triangulation of theories – use of multiple hypotheses and perspectives.
- Methodological triangulation – use of various methods.

Triangulation of data can include visual data being triangulated with verbal data (Flick, 2004). In a study such as this research programme, which makes use of qualitative elite interviews in order to comprehend the economic cost base of a typical automobile company it is clear that triangulation of data predominates. It was the converse for investigator triangulation, there being but one researcher for the programme and so investigator triangulation was not an option. Concerning triangulation of theories, it is an approach where:

"...the results of an investigation employing a method associated with a research strategy are cross-checked against the results of using a method associated with the other research strategy." (Bryman, 2001, p.447)

Although this research programme took two theoretical approaches, one for the size of the company and the other for its structure, they were discrete from one another and so cross-checking between them was not possible. There was some methodological triangulation using literary sources for building the conceptual framework and sourcing archival data, with the data from the fieldwork then being used to provide an empirical context.

Triangulation is intended to bring mutual validation, but Flick (2004) warns that there is a specificity to the different methods and sources which must be recognised. Just as theories on company size and company structure can both describe the same organisation, they do so from entirely separate theoretical perspectives. Denzin has subsequently taken the view that the typology of triangulation may not so much a tool for validation but more a strategy for gaining a more sophisticated understanding of the subject. Janesick (2000) evolves Denzin's view from the two-dimensional triangulation analogy to one of crystallisation, one that describes having multiple views onto the subject like the facets of a crystal. It is not, therefore, about validation but the gaining of additional knowledge (Flick, 2004). Nevertheless, triangulation is the generally accepted term for describing a research design bolstered by additional sources of information.

The data gathering of this fieldwork was designed to create a network of references that would illuminate the different aspects of organisational size and structure. This involves not only searches of the available literature but also empirical data from the research interviews. The purpose of the interviews was for them to both triangulate with the archive data from the literature and to triangulate the case study company, MG Rover, with the fieldwork conducted in the contextual automobile industry. The interview protocols achieved this level of triangulation by seeking insights into certain fundamental questions across all the interviews. As a group, all the interviews were triangulated with the literature since the questions were derived from it. Triangulation amongst the interviews was then effected on two levels: between the literary and empirical sources, and between the individual internviews.

3.5.1 Literary and empirical source triangulation

The research questions concerning company size, structure and the degree to which these excluded approximations led into a review of the literature to discover the prevailing theories. Since it is assumed that the underlying technology in the mass market automobile industry has been constant for over half a century, notwithstanding process improvements, the data found in the literature is considered to be of archival, rather than historic, relevance (see 2.1.1). The archive data can then be used to inform the conceptual framework concerning company size and structure.

This has been particularly relevant in the matter of survivor analysis which assesses the development in company size over a period of time. Such a longitudinal approach would not have been feasible for a research programme of this kind due to time and resource constraints. Since a problem with archive data is that it is filtered through the original research first, triangulation can be employed by using different sources of archive data and then bringing in empirical data gathered during the fieldwork phase of this research programme.

3.5.2 Interview triangulation

The interviews were all conducted with those who were influential within the industry. They were also selected to represent a wide range of perspectives with the intention that they would triangulate with each other. Within the MG Rover case study interviews, the interviewees, including ex-employees, represented a range of competencies. For the company these were as follows:

- Senior Management
- Public relations
- Engineering
- Strategy
- Human resources
- International sales
- Independent analyst

Some of the interviewees were able to speak on behalf of more than one area of knowledge, for example senior managers Mr Bob Beddow and Mr Rob Oldaker were also qualified to talk about HR and engineering respectively. Mr John Bacchus had been a senior manager with experience of strategic planning and a strong background in accountancy yet, as a retiree of the firm now working in academia, he also had a level of independence, often expressed as cynicism. Most of all, top management have the ability to convey an overview of the company, so the degree to which interviewees were able to digress from the remits of their formal job titles is not of particular relevance; the importance lies in the range of experience they could bring to the research. This created the conditions for a degree of consensus which might not have been possible if interviewees had stayed within their technical competencies, for example if Mr Beddow had restricted himself to HR concerns. The result would have

been a plethora of unrelated views that resisted a unifying view of the company's situation.

The interviews that took place outside of the case study company were to provide contextual data and bring another level of triangulation. The interview protocols were designed to be comparable and again the interviews were grouped into similar categories:

- Senior Management
- Public relations
- Engineering
- Independent analysis
- Political Institutions
- Industry Institutions

In these interviews, "strategy" was not found as part of a formal job title, although the subject was discussed on many occasions. Instead, there is the addition of institutional, political and research job categories. This disparate array of data would support a particularly robust framework should a unified argument concerning the automobile industry emerge. For these interviews, the subject matter was more general in theme, making reference to the challenges of the industry. Indeed, a point of interest is that such was the dominance of British Leyland and Rover Group in the UK in the past that many of the contextual interviewees had experience with the firm and so were able to make informed comparisons.

As previously noted, a great deal of the contextual research was conducted at Honda. Due to the limitations of access at Honda it was not possible to match the competencies of the informants with those at MG Rover. This is countered by the wider overview that the interviewees had, most notably Mr Yoshino. The functionary competencies covered were as follows:

- Top management
- Public relations
- Engineering
- Strategy
- Independent analysis

The range is further narrowed by the engineering bias at Honda, Mr Yoshino being no different to previous CEOs in rising to the top through Honda Research and Development, while the strategy team were also from an engineering background. The independent analyst was an academic, Tsutomu Demizu, who had a very close knowledge of the company and its development.

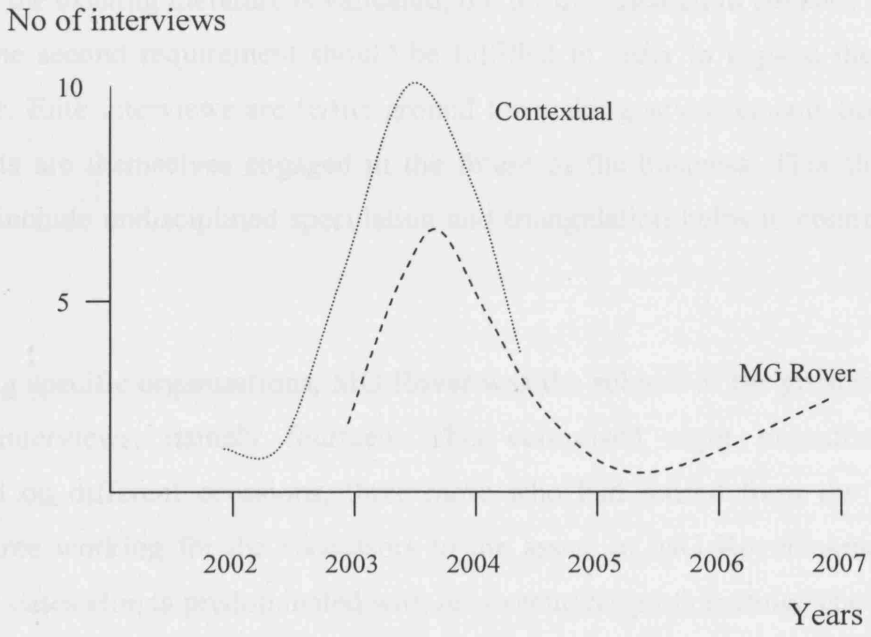
Although widening the scope of interviews within companies can unveil a unified view of the company, there is still a danger of group bias. This might even be formally expressed by the public relations personnel who are the appointed spokespersons for the company and the message it wishes to convey. Their contribution is, by corporate intention, triangulated with the other informants within the company but it does not tackle the group bias, indeed it may reinforce it.

The prominent role played by Honda as a contextual company, and one that had enjoyed close links with the predecessors of MG Rover, meant that rich data could be gathered for comparison. MG Rover and Honda were both independent companies but were diametrically opposed in terms of scale and global spread. Many of the challenges facing the British company were the same ones that Honda had faced in the past. Taking the notion of independence as an example, it could be a manifestation of management hubris at MG Rover, or a positive way of expressing a failure to find a collaborative partner, but Honda's success shows independence has some merit. Thus claims that independence can bring a competitive advantage are validated by Honda even if they had appeared suspect at MG Rover.

3.5.3 Interview frequency

The case study research strategy related MG Rover to the different contextual companies at both data gathering and analysis stages. The purpose of the laddering interview method was more than to aid data gathering within the companies, it also informed the interviews at the other case studies. Since the initial interviews were conducted with MG Rover this meant that the topics were more refined by the time of the fieldwork in Japan over a year later. Figure 3.1 shows the relative timing of the case study interviews along with the contextual interviews, indicating how the contextual interviews preceded those at MG Rover although with the bulk of the fieldwork was contemporaneous. Contact was maintained with MG Rover personnel even after the financial collapse of the company and Figure 3.1 records interviews with those who went on to work for the Chinese buyers of the assets. The illustration gives an impression of the approximate frequency of the interviews in total, drawn as a line graph to illustrate the manner in which interviews linked to each other.

Figure 3.1 Frequency of interviews



In all, the fieldwork took in fifty-four elite interviewees lasting one and half hours on average. The first interview took place in July, 2002 and the last in February, 2007. This comprised eighteen interviews at MG Rover and related organisations, with

another thirty-six in the contextual industry. Details of all interviewees are listed in Appendix 1, and where more than one interview took place the appropriate date will be indicated when it is referred to in the text.

A particular problem with this style of qualitative data gathering was in deciding how many interviews would be necessary to draw valid conclusions. The statistical measures of confidence that quantitative studies can call on were naturally not available. The number of interviews is also an ill-defined requirement in the qualitative methodological literature, and the advice of one academic that 'you know when you know' was considered especially unhelpful. This research therefore devised two requirements: first that the research questions should be answered and, second, that the body of knowledge should be advanced.

For the first requirement the research questions were formulated from the existing literature, with specific questions arising during the laddering build-up of successive interviews. In order that the questions could be sufficiently answered, the interview data needs to be mutually supporting through triangulation. To the degree that this is successful the existing literature is validated, but for the research to advance into fresh territory the second requirement should be fulfilled in order to expand the body of knowledge. Elite interviews are fertile ground for making advancements because the respondents are themselves engaged in the future of the business. This should not, however, include undisciplined speculation and triangulation helps to control against this.

Concerning specific organisations, MG Rover was the subject of the greatest number of elite interviews, namely fourteen. This comprised eight executives being questioned on different occasions, three more who had retired from the firm and another three working for the successors to the assets of MG Rover. Amongst the contextual cases Honda predominated with ten executives participating. The rest were distributed across various sources and provided additional perspective. As the interviewees were aware of the purpose of the research they often made comparisons on their own initiative. The location of the interviews is not of material consequence either; some of the interviews that informed on the issues facing the British industry taking place in Japan.

A further requirement for interview numbers is suggested by the laddering methodology. As successive interviews are linked to one another the process can be considered to have reached its conclusion when no new information is found. In reality this is unlikely, since there is always the possibility of finding one more interviewee who can add knowledge, even if their relevance to the chain of interviews is tenuous. However, when the laddering progresses up the management hierarchy then the limit is reached at the highest effective interview. The data gathered at such an interview should still be in accordance with the two basic requirements to answer the research questions and expand the body of knowledge, yet at the same time this most elite of interviews should yield data of the highest quality. If the two requirements are satisfied by this interview then that ladder can be considered to have reached its limit. The quality of the data gathered by this research programme was particularly enhanced by the participation of highly placed executives, such as departmental heads of contextual institutions, such as the ex-CEO of Honda and the heads of strategy and engineering at MG Rover.

3.6 Ethics

The major ethical problem with research on corporate organisations concerns the treatment of commercial confidentiality. The automobile business is highly competitive and the financial position can be volatile. One hardly needs to review the history of MG Rover to understand that this point is particularly pertinent. This research was not concerned with the details of specific company projects and so commercial sensitivities were unlikely to be transgressed, yet reassurances were given in order to induce a trusting atmosphere to the sessions and encourage communication.

In the course of the introductory correspondence an offer was made to sign any formal agreements to confidentiality. The ultimate purpose of the research was also declared. This simple act appeared to be adequate since no formal, or even informal, agreement was ever demanded. First interview contact was often with the PR representatives but this did not appear to be a deliberate policy by the companies, it was simply that they were more easily identified and available for interview. Those representatives were

present at later interviews in a supporting role; MG Rover's Dr Chris Millard, for example, requested the presence of the PR representative at his first interview (17 September 2004) but this did not impede the flow of information. Indeed, the representative was present only for the first quarter of the interview. Honda's PR representative was present at the interview with Mr Yoshino but in the role of usher rather than guardian.

An interesting point about the observance of secrecy was that companies claimed to have no secrets to hide, at least with regard to the issues under investigation. The motivation tended to be to explain policies and the thinking behind the stories that existed in the public domain. The only subject that appeared to be precluded was by Honda concerning the earlier joint venture with Rover Group, and although no questions were scheduled the subject was frequently broached on the volition of the Honda interviewees. The manner in which this purportedly sensitive subject was openly discussed is an indicator of the generally communicative attitude the interviewees took in relation to all issues. On only two occasions did problems occur, both with PR representatives: firstly with MG Rover's Mr Greg Allport, and then with Honda's Mr Tatsuya Iida, who temporarily refused further contact (see Section 3.3.3 above for a full account). Neither of these were injurious to the research.

As a precaution, the contextual interviews provided the additional information that might make up for any sensitive information the interviewees would wish to avoid. Without the constraints of commercial sensitivities many of the informants, particularly the independent analysts, would be expected to be at greater liberty to speak. That little contradictory data was gathered from such sources is testament to the comprehensiveness of the company interviews.

3.7 Initial phase

Although there was no single pilot study, the nature of ladder interviewing meant that the early data collection formed the foundation for the subsequent fieldwork. The first of these was with Mr Mark Aston, Assistant Managing Director of The Morgan Motor Company. Despite the obvious fact that this company operates at a scale unrelated to mass market car production, and was thereby outside the parameters of the mass production technology, the company was chosen for the start of the research because it was hoped that it would provide a valuable introduction to the conduct of fieldwork. Subsequent interviews gathered an overview of the industry from the trade union perspective and *ad hoc* interviews at motor shows.

3.7.1 Morgan Motor Company – an introduction to fieldwork

Morgan sports cars are described as "traditional", and here that is taken to describe a sports car of 1930s vintage constructed in the artisan craft production style. Yearly production is measured in hundreds, approximately the same amount a mass production facility produces in a single day. The company is also majority owned by the Morgan family, family-owned stakes in volume manufacturers being rare and none in an absolute majority (see Appendix 2). This suggests a sentimental attachment between the family and the firm that may offset the economic demands of automobile production, Harvey-Jones (1990) being particularly frustrated at the conservative character of the management of the company when it came to modern innovations.

While the small size of the company precludes the research from accepting Morgan as representative of the mass production industry, this does not prevent the case from being instructive. Importantly, for an *ab initio* researcher, it is an assembly line in miniature, the entire process being clearly visible from a good vantage point on the factory driveway. Equally, one well-placed interviewee, in this case the assistant managing director Mr Aston, can reveal a managerial vantage point that provides a perspective of the industry as a whole. The interview was semi-structured, as all subsequent ones were, with questions derived from a thorough review of the available literature. The questions were not grouped together into subject areas as were later

interview protocols but Mr Aston was provided with an advance copy in order for him to prepare for the interview. The utility of this tactic led to it being adopted as policy throughout the remainder of the research programme even if the data obtained from Morgan was not useful in formulating a model for the mass market industry.

3.7.2 Trade union perspective

A danger of interviewing inside the industry is the possibility of reiterating orthodox views held by the industry. Even aiming for triangulation by selecting participants widely within the companies would not be sufficient in eliminating the most fundamental company bias. Union leaders were seen as a useful source of data because they conduct their own research focusing on the long term viability of the industry with regards to employment rather than company-centric measures of financial success or personal advancement.

Amicus-AEEU was chosen on the basis that it is the UK's largest manufacturing trade union, representing 35,000 members in the motor vehicle sector, the other main union being the Transport and General Workers Union (TGWU) (Amicus, 2004). The National Officer for the Motor Vehicle Industry, Duncan Simpson, was identified from the union website and contacted by letter seeking an interview. At Mr Simpson's behest, this was arranged at a time and location convenient to him, which happened to be during a union trip to Swansea. The interview took place at his hotel in the evening. The details are relevant because the informality of the event made it possible for Mr Simpson to introduce his colleague, Mr Dave Osborne, National Secretary Vehicle Building and Automotive for the TGWU. This was fortuitous since Mr Osborne was the more active participant in the interview, expressing his views candidly and even aggressively. This was no impediment to the gathering of data, resulting in a reappraisal of the research programme and a later interview with Mr Osborne and his research assistant at the head office in London.

The interview protocol for the first interview was in the same format as the previous one for Morgan, but the content dealt with the British motor industry in general and MG Rover in particular. As before, the protocol was submitted in advance and on this occasion this had an added advantage in that an assistant to Mr Simpson was able to

provide him with written answers to some of the questions in the form of a briefing. Mr Simpson contributed to the interview but in general it was dominated by Mr Osborne. A record was made in the form of interview notes, but it was found that this inhibited the flow of the conversation and did not produce a comprehensive account. The later interview with Mr Osborne corrected for this by use of a tape recorder.

3.7.3 International motor shows

As an opportunity to create a network of potential contacts international motor shows were chosen as an effective forum for making introductions and possibly arranging interviews. This was because motor shows set aside preview days, before opening to the public, when industry executives make themselves available *en masse* for meetings to publicise their work. This would be an excellent opportunity to introduce the research to as many contacts as possible in the shortest time and so ease the process of requesting a formal interview later. Three motor shows were attended: Geneva (March 2003), Tokyo (November 2003), and Birmingham NEC (June 2004).

The Geneva show was particularly attractive because it is, by reputation, more informal than the other international motor shows. The public relations (PR) departments of two companies, MG Rover and Honda, were contacted in the preceding weeks in order to gain a feel for how meetings at the show could be arranged and who would be available. It was soon found that meetings were permissible on an *ad hoc* basis as personnel became available, though as a precaution meetings were pre-arranged with PR representatives of the two companies. These were Mr Stewart McKee of MG Rover, and Mr Chris Rogers of Honda. It was, perhaps, a mark of MG Rover's status at the motor show that Mr McKee was able to be generous with his time in granting an interview. The interview protocol was a generic one to be used at all meetings at the show, based on the first union interview with Mr Osborne but with specific company references emphasised. The interviews were recorded in a written format. It might also be an indicator of Honda's status that no interviews or introductions could be arranged during the course of the show.

Two *ad hoc* interviews were conducted, one with an industry analyst, Mr Pat Devereux, and the second with Mr Greg Allport, the MG Rover General Manager PR

and Events. The interview with Mr Devereux was informal and interesting but did not yield much useful data; the interview with Mr Allport also yielded very little data due to his excessive observance of commercial secrecy, even concerning information available in the public domain.

Although data was gathered at the Geneva motor show and introductions made, considering the time and distance involved it was probably not cost effective. It was hoped that the lessons learnt from this would improve the efficacy of attending the two subsequent shows. The Tokyo show was taken as a convenient starting point for fieldwork that had been previously arranged. It was not, therefore, a crucial feature of the trip but it was hoped that some valuable introductions could be made. This did not transpire, all industry executives being unavailable for anything but media interviews. Fortunately, interviews unrelated to the show yielded valuable data so the disappointment of the show had no material effect on the data gathered during that visit.

At the British Motor Show in Birmingham it is worth noting that MG Rover policy at the show was to make company personnel available on the stands instead of hiring external publicists. It was therefore possible to hold follow-up interviews with Mr McKee and Mr Rob Oldaker, Director of Product Development, who had been previously interviewed at length (6 January 2004). Other industry personnel were again unavailable.

Across the three shows valuable contacts were made, but these could probably have been made without attending the shows themselves. From the experience it is not advisable to rely on *ad hoc* meetings unless attendance at the show is convenient for other purposes. Attendance at such events is, perhaps, more suited to the maintaining contacts through informal meetings.

3.8 Main interviews

Since each interview evolved from the previous one and informed the following one it is not possible to identify a formal pilot study. Even so, the early phase was constructive in laying the parameters for the main thrust of the research and helped to codify the interview protocols. In the early phase, the interview protocols came to be substantially changed for the main company and contextual industry research. The material covered in the interviews was consistent, although with a semi-structured format it was usually tailored to reflect the focus of the particular interview.

The full list of interviews is shown in Appendix 1. They have been placed in two groups, one being for MG Rover and the other for the contextual industry. The interviews are in chronological order within the groups but it should be noted that they were not conducted in a planned order but as interviewees made themselves available. This means that the interviews do not follow on from each other within the groups but across them, so a Kyoto University interview could follow and be informed by an interview with an MG Rover executive, for example. Another point is that the groupings are by interview subject rather than current employment, so some of the respondents are ex-employees of the companies who could provide historical depth. This is appropriate for an industry that takes many years to develop.

3.8.1 MG Rover

The interview protocols were mostly sub-divided thematically: chronologically in the case of John Bacchus (5 August 2003) to reflect the historical antecedents to MG Rover, and thence categorically for all subsequent interviews in order to focus on emerging topics. For the interview with Mr Alistair Morton the chronological format was found to be unsuitable since the interview concerned contemporary concerns rather than historical events. The first categorical interview was with John Bacchus (10 June 2003) which introduced the following headings under which specific questions were grouped:

- Globalisation
- UK Industry
- Japanese Industry
- Foreign Direct Investment (FDI)
- Joint Ventures

The purpose of this was to reflect Mr Bacchus' experience in formulating the joint venture between Rover and Honda by focussing on the relative qualities of the national industries and contrasting joint ventures with FDI. The subsequent interview was with an MEP, Malcolm Harbour, so the category of Government was added to investigate the political angle. At the same time, the comparison between UK and Japanese industries was dropped as this was not central to this interview.

The later MG Rover interviews introduced the concept of culture as a defining commercial feature by asking about brand values. There was also an increased focus on joint ventures, with allusions being made to a developing relationship with Tata of India. Little was made of the specifics of any particular deal, partly for reasons of commercial sensitivity, but more importantly because this research is not concerned with the minutiae of extant relationships but how the executives of the company would like a deal to be structured. Tata is a good example of this: the relationship arose after the collapse of a much vaunted deal with China Brilliance (now known in the West as Brilliance China) and before news of a possible joint venture with Shanghai Automotive Industry Corporation (SAIC). To be concerned with contractual details would be to take an historical stance, one that would quickly go out of date, without giving due prominence to the principles at stake.

3.8.2 Contextual industry

Interviews took place with industry representatives in order to provide context and a wider view of the issues. The thirty-six interviews can be divided into four sub-groups (see Table 3.2). The data obtained covered a wide spectrum, from long-term political concerns to company details.

Table 3.2 Contextual interview categories

Type of Organisation	Organisation
Automobile companies	Aston Martin Bentley Honda Jaguar Japan Morgan Rolls-Royce Toyota
Independent Researchers	Automotive Engineering International Kyoto University Lean Enterprise Research Centre Mitsubishi Research Institute Osaka University Redwood
Industry Institutions	ACEA JAMA SMMT
Political Bodies	METI TGWU Malcolm Harbour MEP

The automobile companies, apart from Toyota, were all in the specialist sector and one, Morgan, has been previously cited as a craft producer. That said, the other companies use current production technology, in Bentley's case a production system based on Toyota's TPS, and Jaguar has production volumes from three factories broadly similar to MG Rover's capacity at one. Amongst them only Morgan and Toyota were independent, but the other four had highly individual brand images which suggests that a measure of autonomy within a larger group was an issue with which they were dealing. This might then further help to define the limits of independence and suggest alternative courses of action for the case study company.

The interviews with Honda came after the first phase of interviews and over half of the MG Rover interviews had taken place. The structure therefore benefited from the experience and they followed the later categorical format. As all but one of the interviews took place in Japan it was necessary to present the protocols to the interviewees months in advance, which meant that there was a common format for each of the three fieldwork tours in Japan, resulting in three formats. Naturally, being

semi-structured, content was allowed to vary between interviews to allow one to inform the next.

Although there were fewer meetings with Honda the earlier experience was put to good effect in yielding focussed data from the start. This was further enhanced by the hierarchical position of the respondents, Mr Hiroyuki Yoshino having been President and Chief Executive Officer from 1998 to 2003, and Mr Saburo Kobayashi being the then current deputy director of corporate planning. The interviews tended to be organised in a formal way with requirements for advance notice of questions, though once underway the interviews progressed smoothly and informally, even with Mr Yoshino. The problem with the organised approach was that interviews could only take place during the brief visits to Japan, seven weeks in total, and executives were not always available at those times. This was most noticeable during the Tokyo Motor Show, despite advice from the company that this would be a convenient time to arrange meetings.

3.9 Recording and coding

The purpose of an interview record is to provide a faithful account of the interview which is then amenable to subsequent inspection. It should not intrude into the interview but the resultant record should be complete enough to serve the purposes of the research. Coding is used to identify the salient points and facilitate analysis. The analysis is not, though, a separate activity since it includes the recording and coding processes, continuing for repeated interactions with the data.

3.9.1 Recording

The first interviews were recorded by taking notes during the course of the interview and expanding them immediately after while the material remained fresh. There were two problems with this approach. The first was that notes were only taken when it was opportune, yet the most inconvenient time was while the most important points were being made. This created a bias in the data away from the most crucial towards the

less important. The second problem was that material could only be revisited through the filter of the original criteria, so it was not possible to glean additional material from that which had been noted at the time. From then on it formed part of the *modus operandii* of the data gathering to record the interviews on audio tape so that, at the very least, repeated listening could be conducted.

The recording of data went further than this as all the interviews that were recorded, bar one, were transcribed. The only one that was not transcribed was with Professor Yasuo Sugiyama, who insisted in speaking in Japanese, despite having both published numerous papers and taking the interview questions in English during what was a rather fractious session. Fortunately, this researcher has a reasonable knowledge of the Japanese language and a basic understanding of his answers did emerge, though they were not of a relevance that warranted the commitment of translating and transcribing in full.

3.9.2 Coding

The list of codes was built up during the coding process in order to accommodate the novel orientations of each interview (see Appendix 12). There were two categories of coding, topical codes and modifier codes. The topical codes followed the topics that structured the protocols for the interviews. Although the earlier interviews were structured chronologically the data was coded according to the topical categories of the later fieldwork. Thus, there were seven original topics and corresponding codes:

- Brand – B
- Economies of scale – ES
- Globalisation – GL
- Government – GV
- Independence – I
- Joint ventures – JV
- Market – MK
- National industry – NI

Since the interviewees were free to introduce topics they felt were of importance, four more topical codes were introduced:

- Company Structure – horizontal or vertical integration (HI or VI), independent (I), multinational (MNE)
- Culture – C
- Environment – E
- Local – LC

The application of these topical codes was intentionally wide ranging. The code ES, representing economies of scale, for example, was applied to any comparison of scale to output in whatever function, it was not necessarily tied to quantifiable production output. The ES code could therefore be attached to engineering output, design staffing levels and sustainable levels of sales.

In order to refine the coding further, modifying codes were used. A typical example would be a country code, so when UK is attached to NI, the code for issues relating to the national industry of the UK is arrived at. Similarly with the government topic, GV, which could be modified by the code for representation (RP) and thereby show how an institution might represent the interests of the industry. If greater precision was required then the country modifier could be attached also, resulting in, for example, GVRPJ, which could signify the Japanese government representation through the offices of METI.

The distinction between topical and modifier codes was not inflexible, it was quite possible for a topic to become a modifier. This tended not to happen with the main topics, such as GL, NI and MK but ES often crossed over. From time to time the coding GLES appeared, signifying the coupling of globalisation and economies of scale. An example of this would be Toyota's search for production capacity outside Japan.

For further emphasis, on occasion intensifier codes were used. This was represented by a plus or minus sign (+/-), and the query sign (?). The purpose of these was to

underline the particularly positive or negative mood of the interviewer. The plus/minus signs were most commonly used in attachment to the independence code (I), denoting perhaps a fierce defence of a company's independence or a belief that it was not sustainable. The query symbol was much rarer, it being used to denote a comment by the interviewee that was of equivocal validity. For example, Malcolm Harbour asserted that Jaguar had been courageous in selecting aluminium for the body of the new large car and so exemplified a degree of independence in body design: considering the level of investment involved it was equally likely that it was a decision made by parent company Ford to experiment with the novel material.

The coding of the data is a link between collection and analysis since it comprises the second iteration of the data after the initial gathering stage. Data analysis takes this further using the codes to organise the material into a coherent argument synthesised from the various interviews. As the following chapters of this thesis have been arranged around specific topics, the relevant data has been allocated to those chapters to which it applies. Thus, the theoretical discussions in the next chapter, concerning economies of scale, are followed by data gathered from the literature and the empirical research.

3.10 Conclusion

This chapter has taken the theoretical considerations on methodology presented in Chapter 2 and applied them to the practical design of this research programme. It detailed the study of automobile companies and industry institutions as the units of analysis, resulting in a multiple case embedded design with the main case study company, MG Rover, being compared and contrasted with the companies and institutions that make up the contextual environment. It detailed the reasons for selecting the case study company, MG Rover, as well as the role of the contextual companies and institutions in triangulating the data. Semi-structured elite interviews were the main tool of empirical research in order to provide a contemporary context for the archive data found in the literature. The chapter charted the progress of the research, outlining the problems and the strategies for overcoming them. The

recording and coding of the data described in the chapter will be put to use in subsequent chapters according to subject matter.

4: Considerations of Scale

In the course of defining the generic structure of a mass market automobile manufacturer it is necessary to establish the forces that form the company. These give the firm the structure and size of its operations. The organisational structure of the firm is defined by the degree of vertical integration, involving the decision whether to source production externally or produce internally, known as the make-or-buy decision. The size of operations is defined by the available economies of scale which encourage the firm to adjust output to a point where costs per unit are minimised.

Different industries will have widely variable integration and scale considerations. There can also be variety within industries as different firms utilise resources in their own unique ways. However, if an industry has a defining technology then all the firms operating that system will be drawn into the same set of economic conditions. The firms will then converge on a generic firm structure.

This chapter of the thesis will illustrate the underlying economic considerations of scale and then demonstrate how they impinge on the automobile industry. As a multiproduct production process, including major components such as engines, transmissions and steel load-bearing bodies, automobile manufacturing comprises a complex array of industrial activities. Each activity has its own optimum level and these need to be matched in order that the total production process should exploit the available economies of scale. Beyond the production processes there are also economies of scope which bring additional advantages to a firm when adding new products to its range thereby utilising existing company facilities more efficiently. Although economies of scope are not derived from the production technology, and therefore do not determine the economies of scale in the industry or the ideal size of firms, by raising overall efficiency they can engender greater sustainability.

4.1 Economies of size

Large firms enjoy a number of benefits over smaller rivals, Pratten (1971) pointing to the power that comes with market dominance. A firm might find it has some monopoly power in setting market prices or extracting lower prices from its suppliers. A larger firm might have political power, able to influence legislation and tax revenue policies in its favour. Internally, larger firms also benefit from team production where members of the team can specialise in tasks (Parkin et al., 1997).

Two further advantages accrue to a large company in connection with its production capability: economies of scale and economies of scope. Economies of scale are related to technical efficiencies and industries that experience its effects find that unit costs of production decrease as output is increased. It is important for planning purposes to note, however, that beyond a certain point increased size of plant may be less efficient; they are then said to be experiencing diseconomies of scale. This consideration of optimal size is a core theme of this thesis since economies of scale indicate the ideal plant size for a firm, and thereby the ideal size for the firm as a whole.

Economies of scope exist when a large firm gains efficiency by more intensive use of its facilities. Although economies of scope are not prescriptive in structuring the firm, and therefore not core to this thesis, they do indicate where a firm might improve its sustainability. For example, the cost of selling an additional product through a shared distribution system might be less than for a rival selling the same product through a dedicated distribution system. The product itself can also benefit by sharing components or even the specialist knowledge in research and development (R&D).

4.1.1 Economies of scale

Cairncross (1966, p.106) describes two different areas where scale may be found: external economies and internal economies. External economies occur when firms have grown large enough that the industry can support its own infrastructure made up of, for example, specialist support and trained labour (Sloman, 2001, p.95). Cairncross (1966, p.107) also includes economies of concentration, when firms congregate in a single location, a tendency recently promoted by the growth of just-in-time (JIT) methods (Womack et al., 1990). Economies of concentration, then, inhibit geographic spread and promote vertical integration by introducing cost advantages when companies are in close proximity. The decision of a firm to vertically integrate or not will be examined in the next chapter of this thesis. The converse is economies of disintegration, the breaking down of the production process into specialist functions that are better served by separate firms or even industries. This does not necessarily promote global spread but it does enable it and suggests opportunities for divisibility within the production transformation process as a whole. Divisibility of production will be covered in Chapter 7 of this thesis with specific reference to vertical joint ventures.

Internal economies of scale, on the other hand, are specific to the firm and Cairncross (1966, p.108) lists five of them:

- Financial economies – the ability to raise capital more cheaply, with increasing returns to scale so that as the firm expands these advantages show a proportionally larger increase.
- Marketing economies – increasing returns to scale through a mix of growing monopoly powers and increasing use of sales capacity.
- Risk bearing economies – reducing exposure to risk by expanding with increasing returns to scale, though a firm can structure itself to similar effect by diversifying output, markets and supply.
- Managerial economies – manifested through delegation of detail or functional specialisation. Delegation only comes with size, management having its own

indivisibility, yet beyond a certain size there may result an unwieldy bureaucracy and diseconomies of scale.

- Technical economies of scale – based on production technology.

Technical economies of scale particularly relate to plant size, though the manner in which the technology is used can still distinguish one firm from another. Cairncross (1966, p.109) puts forward three ways in which a firm may utilise the technology to its own advantage, resulting in economies of superior technique, increased dimensions and linked processes. Dimensional advantages are clear in, say, a blast furnace where a doubling of its dimensions will increase its potential internal capacity eight times. In contrast, there are instances when there are clear limits to dimensional advantages if they are held back by the nature of the product, such as furniture manufacturing, where there are both constraints on the natural size of wood supplied and the humanly suitable dimensions of the final product.

There is also a lower limit to what might be considered to be a production system. Cairncross (1966, p.106) states that there is a qualitative difference between the lone worker and the mechanised production system. To work on a variety of tasks the lone worker must be a generalist, able to vary the intensity and allocation of work but is not able to delegate functions. At larger volumes a production system must be put in place by an organisation, with specialisation in tasks by workers and machines. This is particularly characterised by indivisibilities, the inability to break a task down into smaller units. A specifically sized plant comprising such a system can produce for a range of outputs but average unit production costs will be at a minimum for only specified levels of output. These levels may represent a comparatively narrow band of output compared to the full range that the system can physically operate at, or the minimum may even be denoted by a single level of output. It is at this point that the specific plant is being operated at the efficient level and this denotes the optimum output level for the plant, i.e. the level of output that generates the minimum short run average cost. Either side of this point average costs are higher, either because the plant is underemployed or because it is being overworked and diminishing returns to the

various factors set in. The firm may accept this if it achieves the planned output, but it should be aware that average costs are not at their minimum.

This is not the case in the long-term. Here, the company can plan for a plant that provides the level of output considered appropriate for the demand it believes exists for the product. It is assumed that the larger plant will offer lower average costs otherwise the smaller plants could simply be multiplied. It is also assumed that as the scale of the plant increases, drawing in greater factor resources, the relative factor prices will not be affected (Pratten, 1971). Each plant has its own short-run average cost curve but for planning purposes, when all possible plant cost curves are plotted together, then the long-run average cost curve traces a line around all of them, often being referred to as the envelope curve. Indeed, terming it the long-run average cost curve is misleading since it is not intended to show how costs change over a period of time and Pratten (1971) prefers to label it the scale curve. Nevertheless, long-run average cost (LAC) curve is the generally accepted terminology. The optimum plant size is the one whose minimum short-run average cost point coincides with the minimum for the long-run average cost curve and is thereby able to exploit all the available economies of scale. This is known as the minimum efficient plant size, or MEPS.

Although economies of scale are available for almost any process, the search for the technical optimum, the output level either side of which would incur cost disadvantages, has received most attention because it renders itself amenable to quantifiable analysis. If the technical economies of scale are very large they become a dominant feature of the firm and give the impression that this is the source of the firm's competitive advantage. However, this may mask a lack of economies of scale elsewhere, even diseconomies, particularly in a multi-plant firm.

4.1.2 Economies of scope

Economies of scope are available when the production system is established and a more intensive approach is made to its usage. To achieve economies of scope the minimised costs of production for two goods would have to be less when the system is shared than if the goods were produced separately (Panzar and Willig, 1981). Typical examples include the production of mutton and wool, or a meat packing firm using its refrigerators to also store ice cream. However, for the increase in scope to bring economies there must be spare capacity available or, as Clarke (1987, p.113) describes it, the inputs should be used without "complete congestion". Such inputs are quasi-public in that they have characteristics in common, as opposed to private inputs which are mutually exclusive. If the production of one good squeezes out the production of another to the detriment of the cost structure then economies of scope are not being exploited. Equally, shared production does not mean that economies of scope exist since it might be a case of filling otherwise redundant production capacity. This may even lead to diseconomies of scope but this is acceptable as long as the access to economies of scale compensates for it. Alternatively, exploiting economies of scope may not simply utilise existing scale but lead to its increase, as when an R&D function is expanded to allow the engineering teams to take on a wider range of projects. This might result in diseconomies of scale in R&D which are compensated for by economic advantages elsewhere, such as economies of scale in production or economies of scope in the product range.

Where economies of scope exist they can have integration implications for the firm (Panzar and Willig, 1981). Multi-product firms that are supplying goods which have quasi-public inputs have a motivation to integrate in order to access the economies of scope. Credit unions, for example, enjoy economies of scope in supplying a range of financial products and so tend to integrate them (Youn Kim, 1986). However, there is a degree of commonality between financial products that may not be so apparent in the manufacturing industry. The computer industry can be categorised into software and hardware production yet the integration of these functions into unified firms is rare.

Apple Inc. is one of the few examples of integration but this is less to do with economies of scope and more to do with the unique features of its Mac OS X operating system. As Clarke (1987) points out, specialised processes are integrated to reduce transaction costs rather than to exploit any apparent economies of scope.

Hagel and Singer (1999) looked at how a firm might be divisible according to the different operations. The unrelated operations have differing economic considerations: for example, customer management is concerned with scope whereas production is concerned with scale. This can create a conflict between the operations which is resolved through compromise:

"To protect its manufacturing scale, for example, a company may prohibit its salespeople from selling another company's products, thus limiting their ability to achieve economies of scope." (Hagel and Singer, 1999, p.136)

Applied to a multi-product firm with separate functions the emphasis on either scope or scale may be delineated. To take, as an example, furniture production: the two manufacturing processes for the wooden frame and the soft coverings are mutually exclusive but the designs are sourced from a common R&D function. The design function has the capability to work on many different styles of furniture, from sofas to sideboards, the knowledge in one being relevant to another and thus exploiting economies of scope. For the two manufacturing functions there is little in the way of quasi-public inputs except, perhaps, in being conducted within a single building, and so the main consideration is with scale. The firm's priority, then, is to synchronise the output of the two manufacturing functions in order to achieve optimal output for both.

Scale does not, by itself, compel internal integration of the two furniture manufacturing functions since scale is derived from the production technologies and these are technically unrelated in this example. There may be economies of scope in management which could have some influence over internalising different functions. However management is not specific to production systems so internalising functions for this

reason would result in different furniture firms internalising different functions according to their particular circumstances. As a firm expands its scope it can then suffer control losses and confound strategic decision making which might be addressed using a multidivisional M-form of organisational structure (Armour and Teece, 1978).

Clarke (1987) cautions against viewing a firm as if it were one structured by economies of scope for two reasons. First is that shareable inputs will compel vertical coordination without the necessity for full vertical integration. Second is that diversifying in order to fill existing capacity comes within the definition of economies of scale. Although Clarke concedes that the concept of economies of scope can include all resource-utilisation arguments this can obscure the difference in perspective of the respective scale and structure approaches. To retain a clear distinction between the two approaches this thesis will discuss them as separate entities.

Returning to the example of the furniture industry, at the core of the firm are the manufacturing functions and integration will occur if it is found to be more cost effective to integrate the functions rather than make market transactions regulated by contract. The same principle applies to the internalisation of the R&D function and so all furniture firms, given the same economic environment, will tend towards the same fundamental organisational structure of functions. Economies of scope in management can therefore be considered constant, notwithstanding variation in their actual capability. For the structure of a multiproduct firm, with technically unrelated functions, integration is concerned with transaction costs and this will be discussed further in Chapter 5. Chapter 4 will continue by looking at the influence of economies of scale on plant and overall firm size.

4.2 Production costs

The economic fundamentals upon which all companies are founded are based on the role of production costs. At the simplest, the cost of production is a multivariable function taking in all the sources of production costs. Koutsoyiannis (1979) expresses this as follows:

$C = fn(X,T,P_f)$ where C = total cost

X = output

T = technology

P_f = prices of factors of production

This can be further simplified if it is accepted that costs are only a function of output as long as other cost factors are constant. If this were represented graphically, then changes in costs due to output would be found by reading along the cost curve, whereas changes in the hitherto constant factors would be shown by a complete shift of the cost curve. Technology, for example, includes notions of entrepreneurial and technical innovation resulting in a change in the type or method of production, therefore resulting in a shift in the cost curve.

In the long-run all costs may be varied and so they inform the management as to how to plan for the future. The costs are calculated *ex ante* and are used to consider the optimal production system for an intended level of output. Long-run cost curves include the firm's internal economies of scale but external economies of scale are beyond its control and so changes there, inducing changes in factor prices, will bring about shifts in the long-run cost curve. In the short-run, however, the production system has been selected. The management is now faced with the fixed costs of the production system in place, comprising the capital equipment which cannot be changed in the short-run, and the variable costs over which management does have operational control.

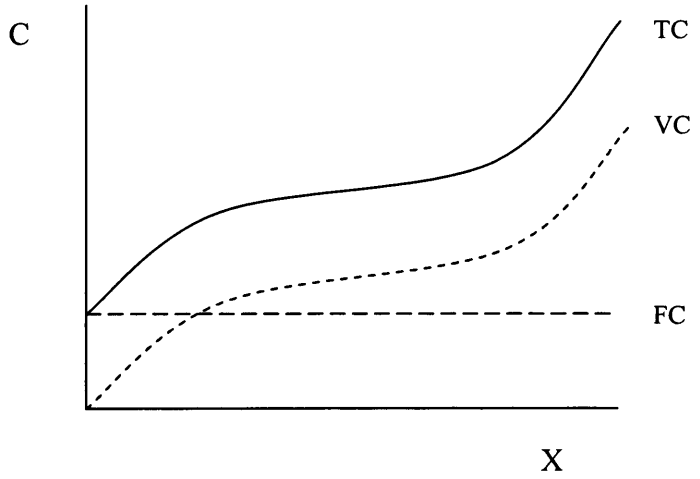
4.2.1 Short-run costs

Total costs (TC) of production in the short-run are assumed to be either fixed costs (FC) or variable costs (VC) (Sloman, 2001, p.86). VC are costs that vary with output volume in the short-run, taking in supply materials, direct labour and fixed capital running costs. FC are taken to be those costs that are not amenable to being varied in the short-run, such as depreciation, fixed maintenance schedules and administrative salaries, even if they are variable in the long-term. TC is therefore described by the formula:

$$FC + VC = TC$$

Initially, variable factors of production exhibit an increase in productivity as more are employed, as a result of increases in marginal product, resulting from increasing returns to the variable factor. Beyond a certain level of employment, however, inefficiencies develop and diminishing returns to the variable factor set in. VC can therefore be represented by an S-shaped curve (see Figure 4.1), while FC can be represented by a straight line parallel to the output axis, the two representations being summed to arrive at the TC curve.

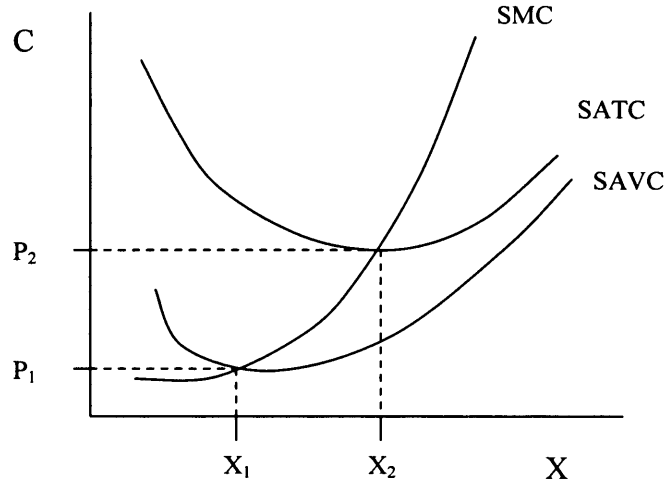
Figure 4.1 Fixed cost, variable cost and total cost in the short-run



Source: Koutsoyiannis (1979)

The S-shaped curve for VC translates into a U-shaped short-run average variable cost (SAVC) curve (see Figure 4.2). The initial increase in productivity is expressed as a fall in cost per output or average variable cost, until a minimum is reached at the trough in the U shape at output X_1. From there, diminishing returns are experienced and so the SAVC curve shows a positive gradient. Since TC is the sum of FC and VC the short-run average total cost (SATC) is derived in the same way as SAVC and so similarly results in a U-shaped curve. SATC, therefore, shows the costs of running the plant as a whole for different levels of output. In studying these curves management are able to identify the point of minimum costs per unit of production (X_2 in Figure 4.2).

Figure 4.2 Plant cost in the short-run



Source: Koutsoyiannis (1979)

The addition of average fixed costs (AFC) to SAVC has the effect of shifting the SATC curve up and to the right of SAVC. Close to the origin, FC has a large impact on TC, so SAVC and SATC are some distance apart. As output increases due to the greater use of variable inputs, AFC falls and the two curves converge. The relationship of the two curves to short-run marginal cost (SMC) is such that SMC intersects SAVC and SATC at their lowest points, X_1 and X_2 respectively. The point X_2 shows where the firm is operating at its optimum for the whole plant, i.e. the minimum of SATC. Parkin et al. (1997, p.265) describe how the intersection of SMC and SATC represents a point of

equilibrium where the firm is capable of breaking even, or earning "normal profit" as the authors refer to it. In terms of revenue, below P_1 variable costs are not being covered so there is no rational reason for production. For any unit price above P_1 and output X_1 the variable costs are covered and a contribution made to the fixed costs. At price P_2 and output X_2 all the costs, both fixed and variable, are covered and the plant earns "normal profit". On the SATC curve any output above or below the optimum denotes higher average costs. In the long-run this may put the company at a cost disadvantage in comparison to competitors so it will need to plan a resizing of the plant. This is covered by the next section dealing with long-run costs.

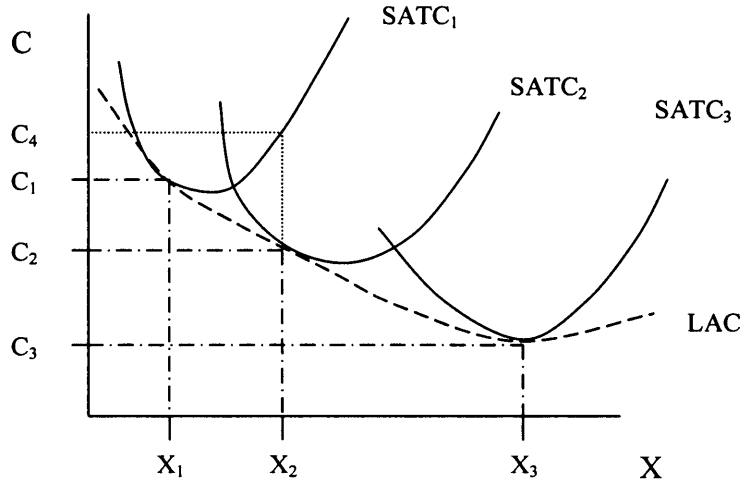
4.2.2 Long-run costs

As has been noted previously, in the long-run all factors of production are variable and this enables the planning of facilities for production in the future as the firm can look at different plant sizes. According to Pratten (1971, p.4) the question facing the firm is as follows:

"What would the effect of scale be on the average costs of production of a series of alternative plants built at a point in time, each perfectly adapted to the required scale and operated at that scale?"

The firm is able to consider different plant sizes, each with its own distinctive production systems, based on the current technical knowledge. Rosegger (1986, p.72) cautions that the long-run average cost curve (LAC) does not describe costs in the long-run but reflects the cost structure of a long-term commitment and is therefore a planning aid. The plants are theoretical at this stage but can be realistically costed as part of the planning process. Figure 4.3 shows the SATC for three plant sizes: $SATC_1$, $SATC_2$ and $SATC_3$.

Figure 4.3 Alternative plant sizes for long-run planning



Source: Koutsoyiannis (1979)

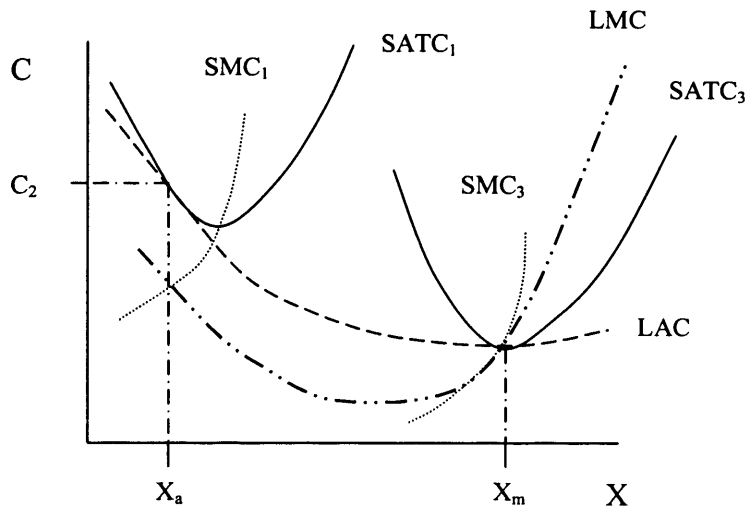
The LAC envelopes the SATC curves for the three plants under consideration. It is drawn as a smooth line on the assumption that there are an infinite variety of plants, not just the three shown. If this were not so and there were only three available plant sizes then LAC would be scalloped as it traced around the outside of the three plant curves, from one curve intersection to the next (Thompson and Formby, 1993, p.224). The company would then select the plant size that was best suited to the appropriate level of output in the long-run. If output X_1 is planned for then it is clear that the firm would select system $SATC_1$ with average cost C_1. At output X_2 the firm would need to decide if the new output was for the short or long-run. It therefore has a choice between staying with $SATC_1$ and accepting that average costs will rise in the short-run to C_4, or taking the long-term view and reconstructing around plant $SATC_2$ and benefiting from the lower average costs, C_2, in the long-run. The crucial decision depends on the future long-run expectations of the firm. Taking the long view, the company uses LAC to select the plant which, in the long-run, will produce the company's planned level of output at the minimum unit cost, but can, in the short-run, cope with temporary increases or decreases in output.

At output X_3 the company would be aware that plant $SATC_3$ would not only be most suitable for the desired output but would also give access to all the economies of scale

available. Up to this point increases in plant size would enjoy increasing returns to scale but beyond it there would be decreasing returns resulting in diseconomies of scale. The minimum point for $SATC_3$ coincides with the minimum of LAC to denote optimum scale in both the short-run and the long-run. LAC is also in tangential contact with $SATC_1$ and $SATC_2$, but not at the minimum points for each curve. Assuming that the production systems are inflexible then for $SATC_1$ and $SATC_2$ the contact is on the negative slope of the SATC curves, revealing increasing returns to scale. In Figure 4.3 this is shown by output X_2 which is achievable, either by under-utilising plant size $SATC_2$, or over-utilising plant size $SATC_1$, though as already noted, plant size $SATC_2$ gives rise to a lower unit cost (Thompson and Formby, 1993, p.225). Those plants that are larger than $SATC_3$ are assumed to suffer diseconomies of scale, perhaps due to the managerial diseconomies described by Cairncross (1966).

The development of long-run costs can also be expressed incrementally by investigating marginal costs (MC). MC in the long-run (LMC) is not an envelope curve since it connects the points on the SMC curves that signify the output where the LAC-SATC curves are in tangential contact. This is clarified by Figure 4.4 showing SMC and LMC intersections at outputs X_a and X_m, omitting $SATC_2$ for clarity.

Figure 4.4 Marginal cost in the long and short-run



Source: Koutsoyiannis (1979)

Moreover, X_m marks the intersection of four curves in total such that:

$$SATC_3 = SMC_3 = LAC = LMC$$

The firm will choose whichever short-run cost curve gives it the lowest per unit cost in relation to desired output. X_m, though, brings further advantages because it is the point at which the lowest absolute per unit cost is achieved in the long-run, assuming that the firm can justify the level of production. This, then, is the optimum plant size and is the one that can exploit all available economies of scale. The smallest size of plant, or lowest output, that still exploits all available economies of scale is said to have the minimum efficient scale (MES) or be the minimum efficient plant size (MEPS). The terms MES and MEPS tend to be interchangeable in the literature, although this thesis will use MEPS when referring to specific plant sizes and MES for the firm as a whole. In Figure 4.4, MES and MEPS are represented by output X_m for a single plant firm.

In practice, it may prove difficult to define the MEPS since the planning horizon given by the LAC is based on existing technology and a cost minimising, profit maximising

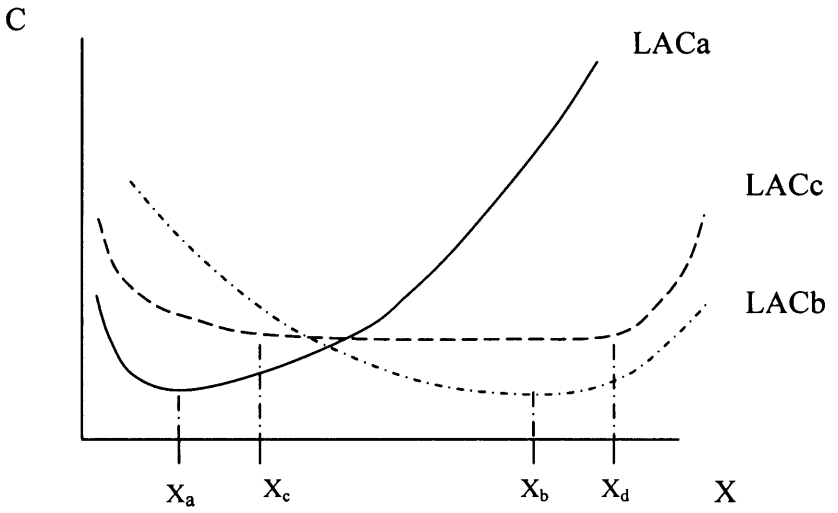
firm would not seek to offer itself as an experiment in diseconomies of scale. For this reason plant sizes beyond the MEPS tend to be speculative or exploratory in character, rendering the shape of the LAC highly uncertain after the MEPS. Pratten (1971) does not consider the MEPS to have progressed if a newly developed plant doubles the scale but delivers a reduction in total average unit costs of less than 5% and a reduction in value added per unit of less than 10%. The next section of this thesis will look at how different shapes of LAC affect the long-term plans of companies

4.2.3 Alternative long-run average cost curves

The implication of the U-shaped LAC curve is that there is one size of plant that enjoys all the economies of scale and thereafter increasing plant sizes are weighed down by decreasing returns to scale. In other words, the larger plants suffer from increasing unit costs. However, the danger of this occurring may cause companies to avoid exploring the LAC curve beyond the established MEPS and so the precise shape of the curve remains largely conjectural (Pratten, 1971).

Thompson and Formby (1993, p.229) provide three basic shapes of curve, and these are illustrated in Figure 4.5 below. LACa shows the early onset of decreasing returns to scale at X_a, which is in contrast to LACb which delays their onset until much later, at X_b. LACc describes a wide range of outputs in a saucer-shaped curve, from X_c to X_d, over which constant returns to scale are being exploited, before decreasing returns set in. This means that firms with plants of different sizes can operate with the same level of average cost. This should not be taken to mean that a large plant can be run at the same output as a smaller plant for the same average cost, but it does mean that for planning purposes there is a wider choice of outputs with each denoting an optimum of a particular plant's SATC curve that is equal to that of another plant of a different size. The smallest size of plant that is still on the flat, lowest, section of the curve is the one that has achieved the minimum efficient plant size (MEPS) and suffers no production cost disadvantage against any other size of plant on the flat section. This is represented by X_c on LACc.

Figure 4.5 Alternative LAC curves



Source: Thompson and Formby, 1993

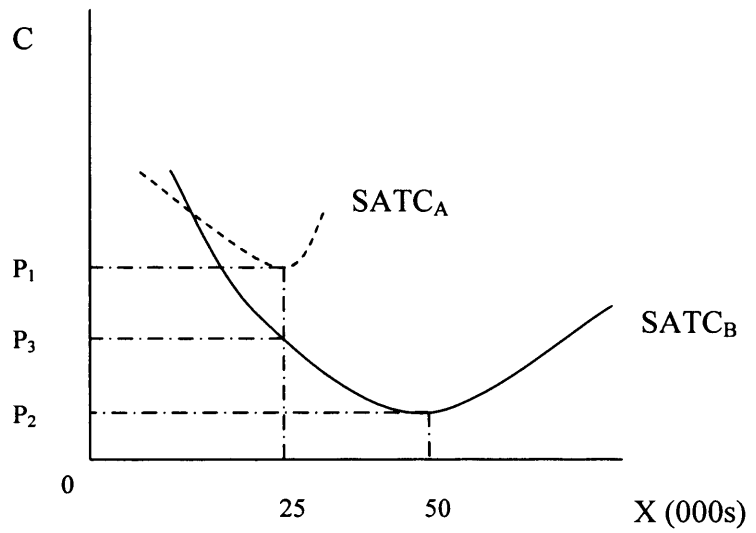
The alternative LAC curve shapes, LACa and LACb, can cause particular planning problems for multiproduct firms operating a number of different production processes. This is because the different optimum production levels for each process need to be matched, first to each other and then to the desired final output. This is considerably eased if a curve like LACc is present because there is a wider choice of plant sizes available for achieving such matching.

4.2.4 Integrating different production processes

At the plant level there may be supplementary processes which are indivisible. When integrating different processes the optimum output then becomes the optimum for all the processes in combination with one another. Maxcy and Silberston (1959, p.76) give the simple illustration of two machines, A and B, Machine A producing 25,000 items a year to feed Machine B, which has a capacity for 50,000 items a year. To achieve the 50,000 items, though, would mean duplicating Machine A, and, furthermore, an output

of 100,000 would mean operating four of Machine A and two of B. Complete processes are often a compound of manufacturing activities like these, for example forging involves not only moulding the parts but also machining them, subsequently followed by assembly. There being no common technology between the processes, synchronising the processes can be complex. Figure 4.6 illustrates the way in which machines A and B relate to each other.

Figure 4.6 Matching machine outputs



Source: Maxcy and Silberston, 1959

Figure 4.6 shows that to achieve the minimum short-run average cost for Machine A ($SATC_A$) an output of 25,000 units at cost P_1 is appropriate, which is shown by the cost curve for machine B ($SATC_B$) to mean higher than minimum costs on that machine (P_3 compared to P_2). Machine A can be doubled up so that both are operating at their optimum of 25,000 to match the 50,000 optimum for Machine B at cost P_2, but if demand slackens and an output of only 25,000 is achievable then neither Machine B nor the two Machines A are running at their optimum. At this level, the costs for two Machines A are higher than if the company had planned for the lower level and installed only the one Machine A. The principle can be extended to entire processes contained within one plant. The optimum for a company is dependent upon the lowest

common multiple of the processes that make up the firm's activities (Rhys, 1972, p.289).

The consolidated figure for all the different outputs would be the optimum for a single production transformation process contained within a plant. Firms do not necessarily structure themselves around this one process, though, and indeed may encompass technically separate plants providing the main components for assembly into a final, complex product. At the planning stage, the multi-plant company would need to be aware that the short-run cost curves for all the plants would need to be synchronised according to the same principles as for individual machines within one process. Moreover, the company would need to also refer to the relevant long-run cost curves for each plant to arrive at a long-run structure for the company as a whole.

4.2.5 Cost curves for the multi-plant firm

The multi-plant firm is one that manufactures items using technically distinct processes. If the product is kept constant while the plant sizes are varied, which might happen if the plants are of different ages, then Thompson and Formby (1993, p.396) recommend three steps to bring the plants into the most technically efficient alignment:

- Step 1 – calculate firms MC from the various plant MCs.
- Step 2 – calculate most profitable output where overall MC equals overall marginal revenue (MR).
- Step 3 – allocate profit maximising output among the plants so the MCs of the last products at each plant are equal.

This can be expressed by the formula:

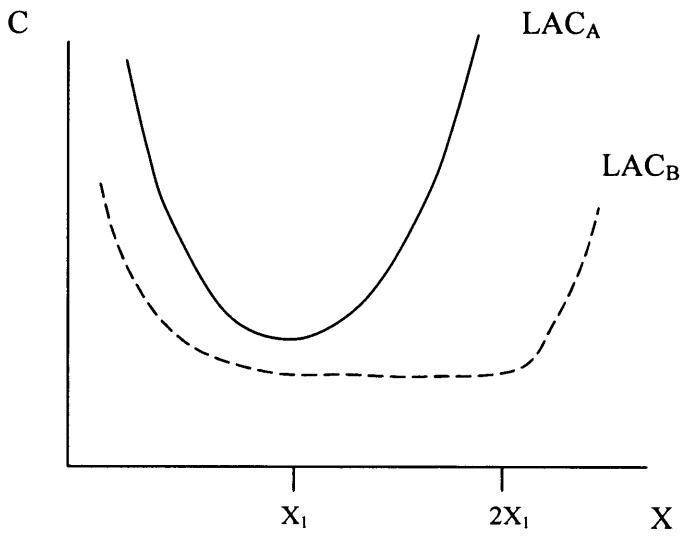
$$MR = MC = MC_{P1} = MC_{P2} = \ldots MC_{Pn}$$

where P1 and P2 are various plant sizes up to plant Pn.

In the case of a multi-plant firm manufacturing component parts for a single final product then the plants differ not simply in size but in the fundamental production technology. Synchronising the output levels so that all are operating at their optimum is eased if they have "reserve capacity" (Koutsoyiannis, 1979). This is illustrated by a flat base to the short-run cost curve, a saucer-shaped curve (similar to LACc in Figure 4.5 above), and though plants may still have to be multiplied along the same principles as for matching the output of different machines (Maxcy and Silberston, 1959) at least the range of optimum values facilitates this process.

At the planning stage, the long-run costs under consideration by the firm are similarly eased if there is a range of optimum values exhibited by the different plants. If plant A has a very sharp, U-shaped LAC then the alignment with plant B's LAC is more easily conducted if that for B has a wide optimum range. This is distinct from the SAC curve: a saucer-shaped LAC curve means that different sizes of plants can all be operating at the same minimum cost. The firm is not, then, tied to one size of plant for this particular process. While the company might establish one plant A and one plant B, from a planning perspective it can look to expand with varying sizes of plant B without encountering diseconomies of scale. Figure 4.7 below shows this for the two plants, A and B, where LAC_A offers little in the way of alternative plant sizes while LAC_B has a wide choice of plant sizes. However, if LAC_B is still flat where the output of LAC_A is doubled, shown by point $2X_1$, for two plants of A producing at output X_1 to match the output of just one plant of B producing at output $2X_1$, plant B would result in the lowest unit cost. This introduces an additional degree of flexibility to long-term planning.

Figure 4.7 LAC for two plants



The ability to combine plants effectively, such that each is operating at minimum cost, is particularly relevant to industries involving multiple products. The plants are likely to have none or few technical commonalities and so the only common link is in final assembly. If each manufacturing process comes under the remit of a single company, then it is the company's responsibility to align the plant outputs with each other in order that an overall MES for the company might be achieved. Finding the precise output quantity of output necessary for MES can be difficult to calculate but it may be inferred when certain sizes of firms have shown significant longevity. The method for doing this is discussed in the next subsection concerning the analysis of firm survival.

4.2.6 Survivor analysis

As Pratten (1971) points out, quantifying economies of scale is fraught with difficulty since it is not possible to inflict experimental research techniques on commercial operations. Neither is it possible to simply assume that the firms that are ranked the highest in terms of output have the greater access to economies of scale since ranks may change without revealing the variation in output quantity that brought about the new rank (Hymer and Pashigian, 1962). Instead, Rogers (1993) suggests that the three possible approaches to determining the relationship between plant size and production cost are econometric, engineering and survivor analysis. The econometric cost curve estimation appears highly quantifiable but suffers from difficulties in measuring certain costs, such as normal profit and cost of capital. The engineering approach looks at the costs of the inputs but the cost structure can be skewed by the relative availability of particular factor inputs, thus precluding direct comparisons between plants in different locations. The approach can explain where efficiencies have occurred but it is not predictive in showing which plant will be the most efficient. In any case, such definition of costs may not be necessary, Frech and Ginsberg (1974) stating that it is more important to be able to understand that those involved in the activity will strive to maximise some utility function and will therefore alter the size of their organisation should they observe one that is better able to maximise it. As Altman (1999) asserts, it is only necessary that a firm behaves in a manner that is consistent with its survival. George Stigler (1958, p.54) criticised the econometric and engineering approaches for failing to take into account the effectiveness of the inputs:

"...as if one were trying to measure the nutritive value of goods without knowing whether the consumers who ate them continued to live."

He proposed an alternative, the survivor principle, which took a retrospective, longitudinal view. This determined economies of scale based on the Darwinian assumption that the companies that out-lasted the competition must enjoy the lowest costs, or in more general terms, an advantage that was contingent upon the size of their

output. The theory proposed that the most efficient company size would take the largest share of the market, and by extension the most efficient company would operate with the most efficient plant size. Stigler used this technique to investigate the existence of economies of scale in the US steel industry, each plant size representing a short-run cost curve tracing out part of the long-run cost curve for the industry. The smallest and largest plants lost market share over the two decades of the study, suggesting that they operated in those parts of the LAC curve that brought decreasing returns to scale or suffered diseconomies of scale. Medium sized plants tended to survive, suggesting that they operated in the extended flat section at the bottom of the curve.

Stigler's study showed that the survivor approach observes firms converging on an optimal size MES, or MEPS in the case of a single plant firm, during which time they take an increasing share of the market while their smaller rivals leave the industry or are consolidated into larger groups. This implies that firms that have been in the industry for longer will hold an advantage since they have had more time in which to reach the most efficient size. Dunne and Hughes (1994) tested this amongst British companies and found that the smaller, younger companies showed the greater tendency to grow faster. This suggests that as firms converge on the optimal plant size the rate of increasing returns to scale decelerates, implying a flattening to the LAC curve where growth becomes progressively less important.

Klepper (1996) draws parallels with the product life cycle theories which argue that once a new product has reached maturity it is the manufacturing process that comes to prominence. However, this suggests the emergence of a dominant design for the product, which Klepper considers to be an imprecise concept particularly where market demand is diverse. Nevertheless, Klepper (2002) found that the larger incumbents held the advantage because the R&D costs of innovation could be allocated over a larger output. Over time Klepper states that R&D can be costlessly imitated, and it might be suggested that this would be the point at which small firms could enter with commonly held technology and so expand rapidly. The greater advantage, though, lies with entrant firms that are in some way related to the incumbents, perhaps comprising staff

from those firms or being diversifications from related industries (Klepper, 2002b). The Ford Motor Company, for example, was the third firm to be founded by Henry Ford and the remnants of the company immediately preceding it even metamorphosed into the Cadillac company under a different management.

The evolution of a firm is therefore better understood if the industry is taken as the unit of analysis, rather than the product, indicating an industry life cycle. Cantner *et al.* (2006) found that the firm specific factors, such as capital and initial endowments, were major determinants of a new entrant's ability to survive in the long term. Although intensity of competition reduced survivability rates as growth in output was directly reflected in market share, if the market was expanding then this slowed the exit rates from the industry as output could increase, or stabilise, even as market share fell.

Although survivor analysis is useful where market shares are clearly growing in a static market, Koutsoyiannis (1979) points out that this intuitively attractive technique is founded on assumptions that are not always realistic, principally that firms operate under the same set of conditions, and Rogers (1993) points specifically to the different uses made of capital and labour. Stigler (1958, p.57) was not unaware of this:

"Since various firms employ different kinds or qualities of resources, there will tend to develop a frequency of distribution of optimum firm sizes."

Although this suggests that survivor analysis can only result in general indications of optimal output size there is the additional problem of technical advances, which Pratten (1971) shows will result in plants that have different short-run cost curves. Shepherd (1967) even suggested that industry entrants may employ smaller plants simply because new technology permits them to be operated efficiently at lower outputs. Over an extended period of time the LAC curve may become more an historical record of the industry diversity rather than a scale curve to aid in production planning. It could be argued that new production techniques are firm-specific and because they are not available for planning by rivals they are not, therefore, part of the industry LAC.

Makadok (1999) found some basis for this but the effect diminished after a period of around eight years as rivals learnt to imitate each other, referred to by Klepper (2002) as costless imitation.

Taking this point further, in a globalised industry where the technical factors of production are available to all participants, the principles underlying plants with firm-specific advantages will soon become disseminated throughout the industry. This will have the effect of equalising technical resources, leaving local labour resources as one that might provide an advantage that can only be imitated by moving to the same location, assuming that the labour resources are effectively unlimited. In such an industry, the short-run cost curves that comprise the industry LAC might, in practice, imply moving plants to different locations to exploit the marginal cost advantages.

Frech and Mobley (1995) noted that a plant may operate in an environment where it receives assistance from its government in some way, and it could be suggested that this would include a requirement for incoming foreign direct investment (FDI) to engage in joint ventures with local firms. The motivation for government policies of this kind is that joint ventures are an effective way of transferring the advantages of the established firms to the smaller entrants. However, if the industry is global then it is likely that government support would only maintain smaller entrants at the local level while the multinationals continue to enjoy a dominant share of the global market. Lueng *et al.* (2003) found that large foreign banks were compromised by regulations in Shanghai that favoured domestic rivals, which maintained diversity and suppressed dominant market share in the city. However, in terms of total market share, which in an international environment would be global, survivor analysis would still have revealed the overall advantage that the large foreign banks held. This may also explain the finding by Gorg and Strobl (2003) that multinationals are quicker to leave local markets than their domestic rivals when the commercial environment becomes more challenging since they have other locations within the global market. This is not an option for the government assisted local companies which only enjoy such assistance in their domestic environment.

The degree of global market share that would signify the exploitation of economies of scale, though, is difficult to determine. Shepherd (1967) cautions that the technique is descriptive, rather than normative, and predictions based on the measured trends therefore reveal only the current minimum efficient scale (MES), not necessarily the technical optimum. Growth of market share is therefore observed to be converging on an optimum that can only be inferred, the state of the industry being an indication of the current MES for the firm, and by extension, MEPS for the plants that comprise it. Indeed, Shepherd suggests that MEPS is the more reliable measure since the firm as a whole, particularly one of a multinational nature, is subject to a multitude of complex factors. It might be argued, for example, that in the study of foreign banks in Shanghai that local market distortions mean that output there should not be included in the foreign banks' global market share (Lueng *et al.*, 2003). So, while the total output of the banking firm with the largest market share may not necessarily be exploiting all the available economies of scale in the industry, it is quite valid to assume that its largest branch in a market less encumbered by local distortion is operating at MEPS.

On this basis, the more that an industry is globally spread the more reliable the survivor analysis since the various local anomalies will tend to equalise. Furthermore, the survival trends will be more reliable if they are well established over time based on a shared production technology, one where progressive developments are refinements of the existing system rather than a distinct new system. This particularly applies to the automobile industry as long as it is narrowly confined to the mass market passenger car manufacturers using the unitary all-steel welded body for their products. There are other technologies available, but it is this load-bearing body that has become the dominant feature of the volume industry, defining both the product and the production system. Since this foundation for the industry became established in the 1920s it can be assumed that the high entry costs mean that plants are only constructed after rigorous economic evaluations based on long experience have taken place. On this basis it would be unnecessary for a research programme to investigate the minutiae of engineering or econometric costs, the evolution of the industry for the preceding decades being sufficient to establish reliable survival trends. The following sections of this thesis will

examine the market shares of the dominant manufacturers to derive the MES for the industry and then the MEPS for the plants used in the automobile manufacturing processes.

4.3 Economies of scale in the automobile industry

Recent discussion of productivity in the automobile industry has been focussed on the rise of flexible manufacturing, even suggesting that this phenomenon now takes prominence in defining the costs of production. However, flexible manufacturing does not redefine the production technology but is instead a method for more fully utilising it. Truett and Truett (2001) assert that the presence of economies of scale in the automobile industry continues to be a significant factor for companies, recommending that the Spanish industry, for example, would find cost advantages in expanding. The expansion would not necessarily be uniform across all the production processes since each process can have a distinct MEPS. There are four processes that comprise the production of automobiles. Table 4.1 shows the main processes (as described by Rhys, 1972; Wells and Rawlinson, 1994; Wells and Nieuwenhuis, 2001) summarised into four major functions:

Table 4.1 Four major automobile functions

Major Function	Processes
Design (R&D)	Research and development (R&D) Engineering
Pressing (BIW)	Press shop
Powertrain	Forging and machining Foundry Powertrain assembly
Final Assembly	BIW Paintshop Sub-assembly Final assembly

Sources: Rhys 1972
Wells and Rawlinson 1994
Wells and Nieuwenhuis 2001

Pressing and powertrain production use specialised manufacturing processes as dictated by the nature of the product and so are capital intensive. Pressing is the most specific to the automobile industry because it stamps out panels from sheets of steel which are subsequently welded together to form the load bearing structural bodyshell, known in its pre-assembly unpainted state as the body-in-white (BIW). Assembly is a logical sequence of activities that has developed over time and tends to be more labour intensive. Vehicle design is a knowledge-based activity encompassing all the research and development (R&D) necessary to bring a new model to the point of production. R&D is dependent upon human knowledge aided by physical prototypes and, increasingly, information technology (IT).

As distinct activities, each process has its own economies of scale. Husan (1997) states that MES has changed as the industry has developed, notably between the years 1958 and 1975. It is tempting to agree that manufacturing has become more capital intensive but it does not necessarily follow that technical progress leads to greater economies of scale. It may instead lead to a flattening of the LAC curve for the plant, allowing MES to be gained at lower output levels than previously, particularly with the rise of flexible

manufacturing. Table 4.2 illustrates this by comparing estimates provided by Rhys (1972; 1999). The figures presented seem to contradict Husan's view that MES increases over time, at least with respect to pressing and powertrain, though the MEPS for final assembly does appear to have risen.

Table 4.2 Development of MES in the automobile industry

Process	MES	
	1972	1999
Pressing	2,000,000	1,000,000
Powertrain	1,000,000	250,000
Final assembly	200,000	250,000
R&D		2,000,000

Sources: Rhys (1972; 1999)

The figures form Rhys (1999) would suggest an MES for the industry of 2 million units a year, with the plants being multiplied as necessary to meet this common denominator. In the next subsection this thesis we use survivor analysis to attempt to reveal the MES for the current automobile industry.

4.3.1 Survivor analysis of the automobile industry

This survivor analysis of the global automobile industry takes the years 1975 to 2005 as the period for investigation, sampling the data at five year intervals. In taking a three decade period it is ten years longer than the study conducted by Stigler (1958). The 1975 to 2005 period commences with the coming to global prominence of the Japanese automobile industry, the later rise and consolidation of the Korean industry and, lastly, the recent emergence of the industry in China. All the production figures have been sourced from the International Organization of Motor Vehicle Manufacturers (OICA), either directly (2000-2005) or indirectly (1975-1995) from Ward's Automotive Year Books. These published figures have been sourced, in turn, from the national

organisations that collect the data. The year 2006 has been omitted from the survivor analysis since results figures less than a year old from emerging economies are often subject to revision. Output figures from 2006 will, though, be used to illustrate the most recent changes, particularly if they are considered to come from a reliable source.

The growth in the global production of automobiles shows no sign of slowing down, although much of the most recent increase is due to the expansion of output in China. Figure 4.3 shows how the top thirteen manufacturing countries in the world have continued to grow a year on from the survivor analysis period, with all of them producing above 1 million units a year in 2006 (unrevised figures), along with the rate of growth over 2005.

Table 4.3 Top thirteen automobile producing nations

Country	Production (units)	2005-2006 Change (%)
Japan	9,756,515	+6.3%
Germany	5,398,508	+1.1
China	5,233,132	+25.9
US	4,366,220	-6.0
South Korea	3,489,136	+3,8
France	2,723,196	-10.7
Brazil	2,092,029	+3.3
Spain	2,078,639	+0.9%
India	1,473,000	+24.2%
Canada	1,389,536	-4.3
UK	1,442,085	-8.6
Russia	1,177,918	+11.6
Mexico	1,097,619	+22.4

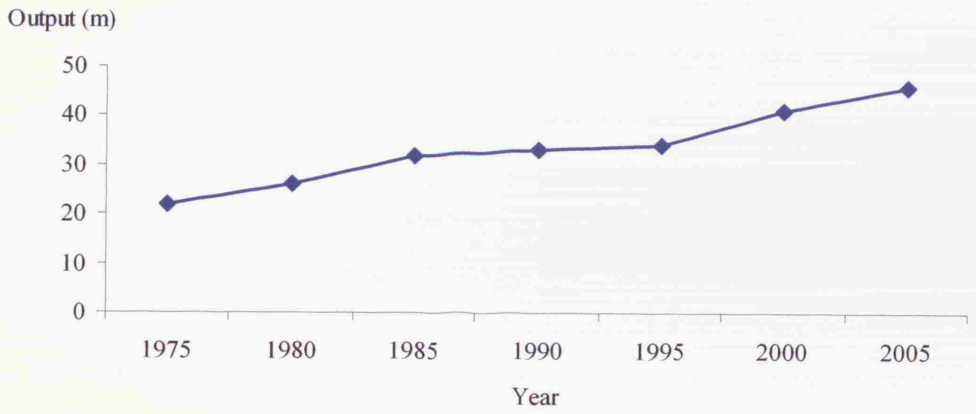
Source: OICA

Although the countries that have dominated the automobile industry for the longest period of time, such as Germany, France and the US, continue to have a substantial presence it is Japan that now holds sway. It also continues to grow at a respectable rate,

the 2006 output figure being an increase of 17.7% over the 2000 result (JAMA, 2007b). Other countries have shown must faster increases in output over 2005, 42.3% in the case of the Czech Republic, but it is China's combination of high output and continued high rate of growth that indicates its possible future status as the industry leader. China even overshadows India which has also shown remarkable increases in production.

It is because of locations like China and India that global production is rising with each successive year. Figure 4.8 traces the change in total global production since 1975 in five year intervals. As Cantner *et al.* (2006) found, the growth suggests that smaller firms will be able to maintain a presence in the industry for longer than if the total global output were stable or declining, and it may even encourage successive entrants to come forward.

Figure 4.8 Total global production, 1975-2005

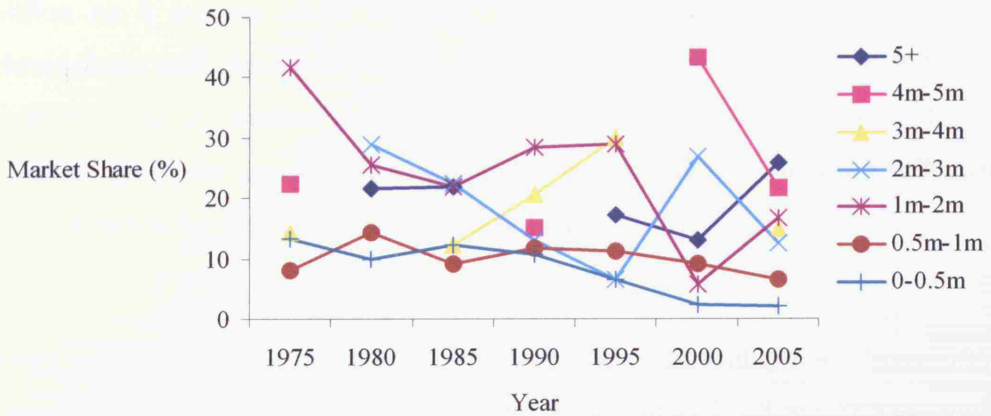


Source: OICA

In order to apply survivor analysis, the total output for each year has been broken down into the contributing output figures from the individual automobile manufacturers. The range of output extended from as low as 29,000 units on one occasion, by Uaz of Russia, to over 6 million units by Toyota. The individual output results were allocated to output ranges and then the production share of the total output by those ranges was

calculated. Initially, these output ranges were taken in 1 million unit groups, except for output in the zero to 1 million units which was divided into two ranges of 500,000 each. This was in order to enable us to examine the movement of smaller companies at the lower limit of the industry. For clarity, the groups have been labelled in output ranges of whole millions (e.g. 1 million to 2 million), though in fact the upper figure in each range should strictly be one unit below that shown. The results for this are shown in Figure 4.9 below.

Figure 4.9 Global production share of output seven ranges



Source: OICA

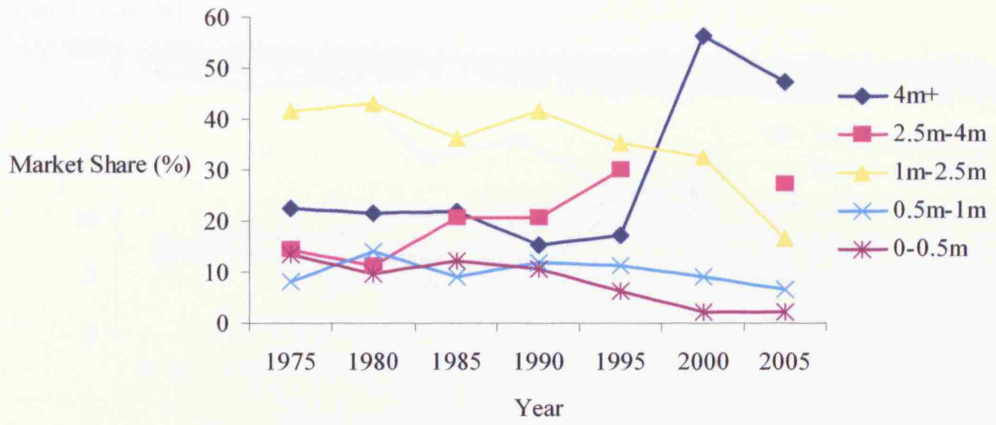
The level of aggregation of output data shown by Figure 4.9 appears too complex to reveal a single overall trend. On closer inspection, the two lowest output ranges, from zero to 0.5 million and 0.5 million to 1 million, reveal a relatively consistent decline. From 1975 to 1985 the two ranges alternate, suggesting movement of manufacturers between the two. From 1990 to 2005 both ranges are in decline in terms of production share, indicating that survival rates below 1 million units a year are deteriorating. Given that throughout this period the majority of manufacturers in this range are Chinese it demonstrates that the government support through enforced joint ventures with foreign companies is not enough to sustain these companies. No Chinese manufacturer has yet broken into the 0.5 million to 1 million range. However, this also illustrates the weakness of survivor analysis in a growing market where production share may decline while output is stable or even growing. For example Chery is making excellent progress

and SAIC is gradually expanding its presence as an independent manufacturer. Subaru has also consistently grown since 1975, starting the period with output of just over 100,000 units and ending it on 500,000 units. These companies may also be joined by other illustrious companies such as Mercedes-Benz and Chrysler as their groups deconstruct.

The other output ranges in Figure 4.9 are even less clear. The 1 million to 2 million range is in general decline though it has wide fluctuations that are mirrored in the opposing variations of the 2 million to 3 million range, also in an apparent decline. The 3 million to 4 million range emerges inconsistently but appears to share some synchronisation with the 4 million to 5 million range which is even more sporadic. The range above 5 million units a year surfaces only towards the end of the period, as might be expected given the growth rate of the global production total, and too little time has elapsed for this to be identified as a significant trend.

To bring greater clarity to the data the three middle output ranges were re-categorised into two, giving 1 million to 2.5 million and 2.5 million to 4 million, and the top range reduced to 4 million units or more. The results of the five output ranges are illustrated in Figure 4.10 below.

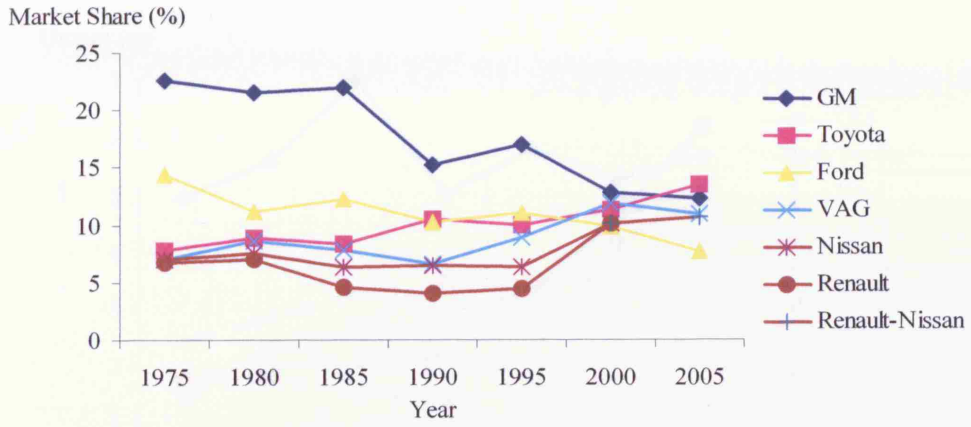
Figure 4.10 Global production share of five output ranges



Source: OICA

Figure 4.10 shows the two lowest output ranges as before but it brings out the decline in the 1 million to 2.5 million unit range more clearly. The share of global production enjoyed by those manufacturers in the 2.5 million to 4 million range has been on an upward trend since 1980, though there is no data for 2000 since they appear to have moved into the range above judging by the sudden rise by the 4m or more range. This is borne out by inspecting the production shares for individual companies for the five highest ranked companies, the industry leaders. Figure 4.11 (see below) shows this for Toyota, GM, Ford and VAG with data for Renault and Nissan as separate organisations until their alliance began in 1999.

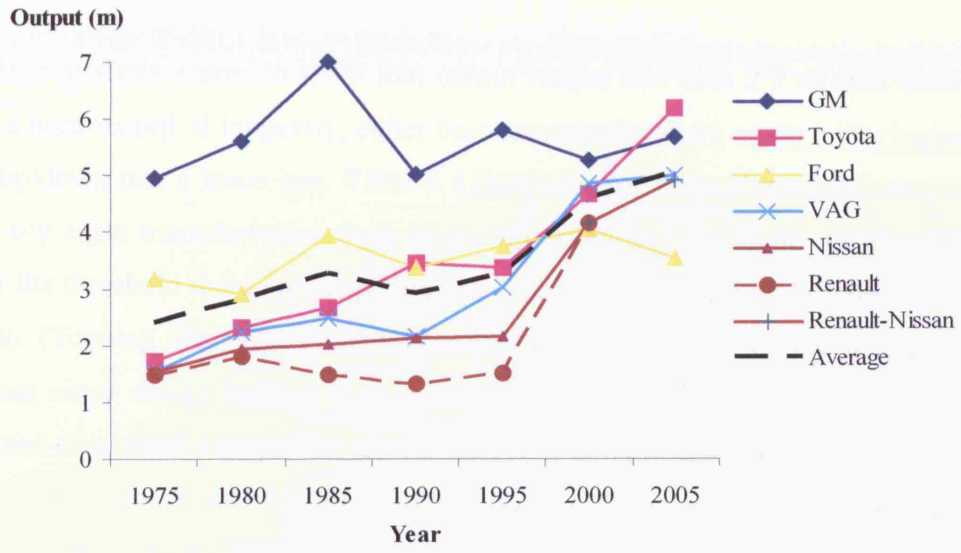
Figure 4.11 Production share for the industry leaders, 1975-2005



Source: OICA

Although Figure 4.11 appears to show a convergence in production share to around the 12% level, excluding Ford's falling share, extrapolating the trends would suggest that Toyota will continue to accumulate production share at the expense of the others, intimating a future divergence of the trends. In addition, in an expanding market even a declining production share will translate into output growth, and this is shown by Figure 4.12 below.

Figure 4.12 Global production output for top five manufacturers, 1975-2005



Source: OICA

The five manufacturing groups shown in Figure 4.12 appear to be converging on each other but it is not possible to estimate what the ultimate level of output might be for as long as the market continues expanding. An average of the outputs for each year can be used to illustrate a trend line over the period for these manufacturers and although this gives an output figure for 2005 of a little over 5 million units the variance on either side of this is over 1 million units. Furthermore, the gradient of the average is clearly positive and will continue to be so as long as the market continues to expand. According to forecasts by the automotive consultancy Global Insight, the world production for automobiles will expand another 28% to over 60 million vehicles by 2010, much of this due to further increases in China where production will be over 12 million vehicles that year. If Toyota maintains the trend in production share growth shown in Figure 4.11 since 2000 then a production share of 15% in 2010 would give it a production output of 9 million vehicles. This is corroborated by Toyota itself which has declared as its target a 15% share of the global car market by 2010 (Toyota, 2007). A further difficulty is that as the market expands manufacturers release more models.

Toyota, for example, lists 53 models in production in Japan alone (Toyota, 2007b), although the number of vehicle platforms is much less.

Survivor analysis seems to show that output ranges less than 2.5 million units a year have a poor record of longevity, either because manufacturers move into a higher range or drop down into a lower one. Table 4.4 shows the top twenty manufacturers for 2005 and only eight manufacturers were above this supposed threshold. Of those that are under the threshold there are some that can call on support from equity holders, such as Suzuki (Toyota), Daihatsu (Toyota), and Mazda (Ford). This may not in itself be relevant since equity holders seek a return on their investment and so it would be expected that these companies should strive to exploit economies of scale just like independent companies. Alternatively, BMW has no external support but is able to practice cost recovery due to its premium brand image.

Table 4.4 Top twenty manufacturers, 2005

Rank	Company	Output (m)
1	Toyota	6.2
2	GM	5.7
3	VAG	5.0
4	Renault	4.9
5	Ford	3.5
6	Honda	3.3
7	PSA	3.0
8	Hyundai	2.7
9	DC	2.0
10	Suzuki	1.7
11	Fiat	1.5
12	BMW	1.3
13	Mazda	1.1
14	Mitsubishi	1.0
15	Daihatsu	0.8
16	AvtoVAZ	0.7
17	Fuji (Subaru)	0.5
18	Chery	0.2
19	Tata	0.2
20	SAIC	0.1

Source: OICA

Although the survivor analysis has been effective in identifying higher output ranges comprising companies that might be considered the industry leaders, it has not conclusively demonstrated that the remaining output ranges, those with falling output shares, comprises manufacturers that are in danger of being eliminated from the industry. Indeed, the growth of the largest manufacturers seems to be a fairly recent phenomenon while the smaller companies, those below 1 million units a year, comprise new entrants together with some of the oldest names in the industry. It should also be noted that in 2007 this range was joined by Mercedes-Benz and Chrysler due to their demerger. Since MES is, by definition, the minimum size that captures all the available economies of scale, the survivor analysis seems to indicate three conclusions:

1. In the very lowest output range the firms are mostly new entrants to the industry.
2. In the 0.5m to 1m output range there are firms that are long-term survivors in the industry.
3. Above output of 2.5m firms have an additional advantage that grows in proportion to size.

To investigate MES more closely, Shepherd (1967) advised the analysis of individual plants to uncover the MEPS first, from which the MES could be derived. This assumes that all companies will attempt to achieve MEPS whatever their overall size, and as they expand they will do so with plants that exhibit the same cost advantages. Thus companies will progress towards MES in units of MEPS. The following subsections will evaluate MEPS taken from the dominant and longest surviving companies in the industry for each of the four processes that make up automobile manufacturing.

4.3.2 Body construction

The distinguishing feature of automobile manufacturing is the characteristic and restrictive manner in which the steel bodies are formed. From the time the automobile was born in 1876 in Baden-Wuerttemberg, where Nikolaus Otto produced the first high revving, lightweight internal combustion engine (Maxton and Wormald 1995), until 1915, car production was a craft activity. This depended on the skills of carpenters to construct and fit an unstressed timber-frame body to a metal chassis. Even in 1920, twelve years after the introduction of the Model T, car bodies were still 85% wooden. Six years later car bodies were 70% steel.

The production revolution took place in 1915 when Dodge lifted output from 5,000 to 50,000 due to the production innovation of Edward G Budd and his Austrian partner, Joseph Ledwinka (Maxton and Wormald, 1995). The process has been termed "the

Budd Paradigm" by Nieuwenhuis and Wells (1997) because it is one that distinguishes automobile production from all other industrial activity. It encompasses the pressing of steel sheets into body panels and subsequent welding together into complete load-bearing car bodies which give the final vehicle its shape and practical purpose. As befits a paradigm, 'Buddism' is restrictive and self-referential since it refers only to the pressing and welding of steel bodies, it is not possible to substitute synthetic materials such as glass reinforced plastic (GRP) and even alternative metals, such as aluminium, can only be used with significant modifications. As a defined technology it also predetermines the available economies of scale. The following subsection will demonstrate the nature of this paradigm.

4.3.2.1 The Budd Paradigm

The paradigm has its roots in the New England clock and lock industry of 1860 (Nieuwenhuis and Wells, 1997; 2007). To make the new technology fit the automotive industry Budd and Ledwinka had to redefine the basic elements of the automobile: the body-in-white (BIW) was formed from the cowl, roof, side and rear panels onto which body panels could be hung. The basic method of forming the panels has not changed since that time: sheets of steel are inserted into high precision dies mounted on presses and the panel shapes stamped out. Those panels that are being attached together are held in place by a jig for welding. The resultant BIW forms the basic structure of the vehicle and can be sent forward for painting, powertrain installation and fitting out in the final assembly function.

The BIW process is capital intensive and highly amenable to automation. Indeed, the costs of the huge step-up in volume that Dodge were forced to undertake eventually led them to look to Chrysler for financial rescue (DaimlerChrysler, 2004). The fixed body structure of the BIW placed physical limitations on the finished model, thus ending the craft era capability of customising each model to the customer's taste. The Budd Paradigm is therefore central to the mass production of standardised automobiles. This was further enhanced by another major advantage of using steel alone which was that

enamel paint could be used and baked at 450°F (230°C), reducing paint drying times from between three and eight weeks to one or two hours (DaimlerChrysler, 2004).

In the early 1920s, Citroen used the same technology to raise its production from 30 or 50 per day up to 400 to 500 per day. In 1925, the technology reached the UK when Pressed Steel was set up by Budd and William Morris. The Budd Paradigm was thus the technological driver that reduced the price of the final product and so created the mass market (Church, 1994). Dodge continued to develop it with the 1928 Victory Six as a 'monopiece' construction of inner and outer panels, followed by the Chrysler Airflow and then the Lincoln Zephyr. Budd perfected the process with the Nash 600 monocoque, which weighed around 600 pounds less than its predecessor and 300 pounds less than the body proposed by Briggs (DaimlerChrysler, 2004). At this point the three main advantages of steel-body production were in place. These were:

1. Ease of manufacturing – production automation, faster paint drying times, suited to high-volume low-cost production.
2. Body strength – obviates need for separate chassis, improves passenger safety.
3. Weight reduction – improves vehicle performance and fuel economy.

The Budd Paradigm also comes at a high capital cost. Table 4.5 shows the typical investment required for such a plant in the early 21st Century, including the paintshop.

Table 4.5 Typical Budd plant investment

Process	Investment (£m)
Press shop	100
Press tooling per model	20-65
BIW construction	50-100
Paintshop	200-250
Total	370-515

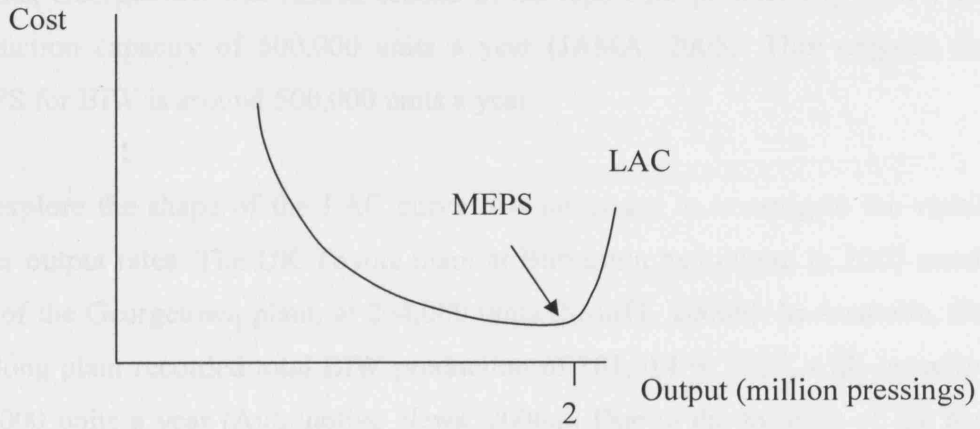
Source: Nieuwenhuis and Wells 2002

The technological basis to the Budd Paradigm processes means that it should be more amenable to quantification of MEPS, as will be discussed in the next subsection.

4.3.2.2 Economies of scale in body pressings

The initial part of the BIW process is the shaping of the steel panels and for panel stamping alone Rhys (1972, p.289) states that the maximum usage that can be expected from a press results in 2 million panels a year, since body presses appear to have an optimum speed of 2 million stampings a year. The dies can last for 7 million stampings, so the optimum number of pressings is 2 million a year over 3.5 years. Since panel production is necessarily capital intensive, the presses cannot be replaced by labour except at the very lowest output levels of craft production, suggesting a single plant size with a short-run minimum average cost equal to the long-run minimum average cost for the industry. Figure 4.13 shows this with increasing returns as production rises to the 2 million mark, but a rapid onset of decreasing returns as the machinery is pushed beyond its design limits.

Figure 4.13 Theoretical economies of scale for panel stamping



However, BIW is also more than simply the stamping of panels, it also involves welding in jigs and paint preparation processes. The MEPS for the entire BIW process

will therefore differ from that of panel stamping alone. Furthermore, BIW production tends to use flexible manufacturing to feed multiple models directly into the final assembly plant, more so than powertrain which can serve multiple models assembled in different plants. It is therefore difficult to use survivor analysis of the main companies in the industry to evaluate BIW in isolation from final assembly. Nevertheless, it is unlikely that BIW, being almost as highly capital intensive as panel stamping, would be allowed to operate with substantial cost disadvantages simply to suit final assembly. Taking this into consideration, it can be suggested that where BIW and final assembly operate together then a sense of the economies of scale for BIW can be inferred if necessary.

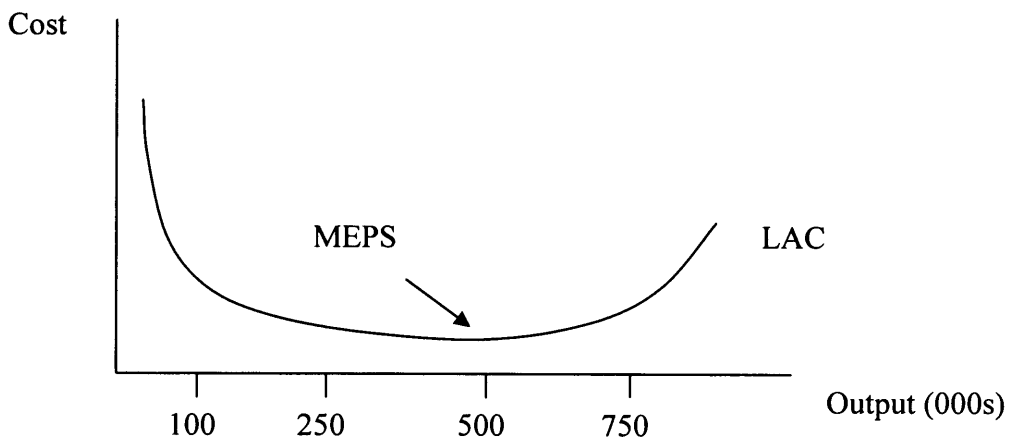
Rhys (1999) bases the 2 million output figure for panel pressing on the technical capability of the machinery. There is little empirical evidence of this occurring, for example Ford's Dearborn Stamping plant presses panels for both the F-150 and Mustang sports cars with combined production in excess of 740,000 in 2005 (Automotive News, 2006a). The Harbour Report 2007 assesses productivity for production plants across North America (Reliable Plant, 2007). For 2006, it concluded that the most productive for stamping was the Honda plant in Marysville and total production capacity for the plant amounted to 440,000 units per year (Honda, 2006). Toyota, Georgetown was ranked second in the report for productivity with a declared production capacity of 500,000 units a year (JAMA, 2005). This suggests that the MEPS for BIW is around 500,000 units a year.

To explore the shape of the LAC curve it is necessary to investigate the viability of lower output rates. The UK Toyota plant at Burnaston had output in 2005 nearly half that of the Georgetown plant, at 264,000 units (SMMT, 2006b). In Australia, the Ford Geelong plant recorded total BIW production of 101,014 in 2005, with capacity set at 120,000 units a year (Automotive News, 2006a). Due to the location of the plant the output probably represents the priority of local assembly over economies of scale, partly due to reasons of tariff barriers, and Silberston (1972, p.377) states that, in such a case, scale has a relative value:

"If the market is too small to contain even one plant of the minimum optimum scale, then it follows that any plant set up to produce for that market cannot be as efficient as it is possible to be, because its scale will be too small."

The difference between the US, UK and Australian output levels is explained by the costs of transporting BIW to Australia and also the tariff structure that adds 10% to imported vehicles. This makes it cheaper overall to produce BIW at Geelong, even at this output level. Much below this and final assembly is usually fed by imports of BIW in complete knock down (CKD) kit form to serve the local market. For example, from 2000 the Opel Corsa was assembled from CKD kits in China at the rate of 22,000 units a year and sold as the Buick Sail (Sieradski, 2002). This suggests that a stamping plant at this level of output would introduce cost disadvantages in excess of the costs of transporting CKD kits from larger plants elsewhere. In view of the various levels of output shown by different plants it would appear that the LAC curve for BIW production has a shallow gradient to the increasing returns to scale side. Based on the Harbour Report, the MEPS is around 500,000 units a year (e.g. Georgetown plant), with a shallow gradient from 250,000 a year (e.g. Burnaston plant) and the onset of diseconomies of scale beyond 750,000 units a year (e.g. Dearborn Stamping). The LAC curve for BIW is therefore illustrated by Figure 4.14 below.

Figure 4.14 Economies of scale for BIW production



In Figure 4.14 the output for the Geelong plant is just above the 100,000 level, at the point where the increasing returns to scale dictate that the curve begins to take on a shallow slope. The Dearborn plant would be near the 750,000 output level, beyond MEPS but the slope of the curve is shallow enough not to incur pernicious cost disadvantages. Between the two would be the Honda, Marysville plant at 440,000 units a year, and the Toyota, Georgetown plant at 500,000 units a year, judged by the Harbour Report to be the most efficient amongst the competition and therefore representing MEPS.

4.3.3 Powertrain

Powertrain production uses processes that are quite distinct from the pressing of shapes into sheet steel that characterises the BIW function. Engines and transmissions are made up of intricately shaped metals that are designed to perform under highly stressful conditions to the extent that parts stamped from sheets of material would not be robust enough. Powertrain parts are therefore fabricated by either casting or forging.

Casting involves producing the basic shape of the component by pouring liquid metal into a mould and then machining away the surplus material to arrive at the final, desired specification. This is commonly used for engine blocks, cylinder heads and gearbox casings. Forging produces components by hammering them into shape, usually when the material is hot enough to be malleable. The desired shape is arrived at by plastic deformation of the material, which also introduces a degree of work hardening to increase the component's mechanical strength. This is applicable to components such as crankshafts, camshafts and piston rods. Although the two processes are technically unrelated there is a degree of substitutability. For example, gears can be cast as blanks rather than forged before the precise shape is machined into them (Gear Product News, 2006).

Bhaskar (1979) suggests that since more than one engine variant would be required for the complete model range the powertrain plant would need to have capacity for between 500,000 and 1m units a year. This appears to be the current requirement in 2006, Ford stating that its British plants in Bridgend and Dagenham will each target an output of 1m engines a year by 2009 (Ford, 2006). The Bridgend plant produces three types of engine on two lines, four cylinder engines on one and in-line sixes and V8s sharing the other. Toyota Deeside produced just under 500,000 engines in 2005, though more than half were exported to other Toyota plants for final powertrain assembly (SMMT, 2006b). In the US, the market is large enough to invite plant investments that explore the economies of scale further. Table 4.6 shows this for the greenfield investments by Japanese firms.

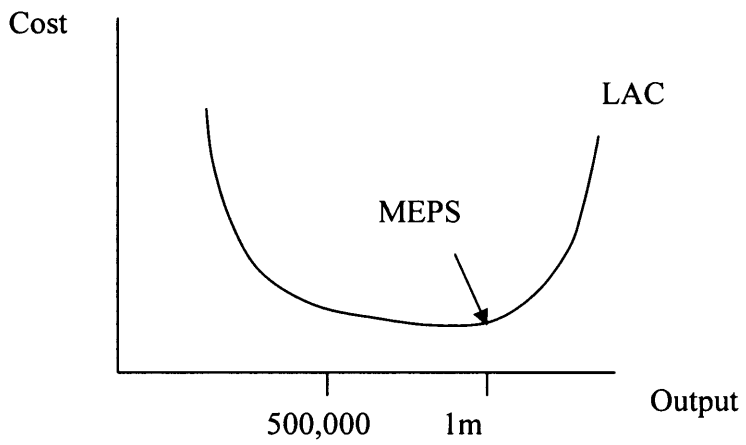
Table 4.6 Japanese powertrain capacity in the US 2004

Plant	Output	Capacity
Honda engines, Ohio	1,079,564	1,160,000
Honda transmissions, Ohio	1,003,289	1,000,000
Nissan engines, Tennessee	728,986	950,000
Toyota engines, West Virginia	456,231	540,000
Toyota transmissions, West Virginia	389,859	360,000 600,000 (2007 projected)

Source: JAMA 2005a

Table 4.4 indicates the range of outputs where economies of scale might apply: from around 500,000 for Toyota up to around 1m for Honda and Nissan. Since Toyota powertrain capacity is the same for the UK and the US, this implies that Toyota has settled on a size of plant that exploits the available economies of scale. Honda, though, shows that scale of 1m is possible and Ford demonstrates that worldwide distribution creates the demand conditions where output of this level can be planned for, even when manufacturing takes place in a market as small as the UK. Figure 4.15 below shows the LAC for powertrain production where the SATC for Toyota plants would have their minimum cost tangential with the LAC curve at 500,000 units a year while Ford and Honda plants would have it at 1m units a year. This LAC curve shows that Toyota is not suffering significant cost disadvantages with such an output, despite its plant being half the size of that of the competition, and so the LAC curve has a shallow slope until the MEPS at 1m units.

Figure 4.15 Economies of scale for powertrain production



4.3.4 Final assembly

Final assembly has come to symbolise the scale of car production more than any other process yet, in practice, it is an uncomplicated procedure that was arrived at through exploration of work practices rather than the development of a core technology. Henry Ford introduced many of the flow production line techniques to the automobile industry and, as a logical process, it has become the standard assembly method for the world's automobile industry, often referred to as 'Fordism' (Hounshell, 1984). Fordism, though, was not a single idea but an approach that integrated and refined production processes while restructuring employment practices. Dankbaar (1992, p.3) states that Fordism was more than simply mass production, it extends into mass consumption since higher wages paid for production translate into higher disposable incomes for consumption.

The principle of the moving assembly line is quite simple, the product being moved along stations to be progressively assembled by stationary employees working from parts delivered to them. Neither is the concept novel, its use predating the automobile industry itself (Lewchuck, 1987; Hounshell, 1984). Even later developments such as the Toyota Production System (TPS) and lean production amount merely to detailed

refinements of the overall process rather than a fundamental change in the underlying principles. It is therefore relatively straightforward for final assembly plants to produce more than one model, and in fact there are few single model plants in operation.

4.3.4.1 Final assembly economies of scale

For reasons of competitive advantage, the quantitative costs associated with any part of production are not usually published so econometric and engineering evaluations of scale are unsuitable, but by using survivor analysis the plant level strategies for production can be analysed. Some additional information comes form the interviews conducted by this research.

Table 4.7 Japanese assembly operations in the US 2004

Plant	Output	Capacity	Utilisation	Employees	Investment $m
Mitsubishi, Illinois	112,984	240,000	47%	1,786	1,514
Nissan, Mississippi	267,350	400,000	67%	4,100	1,430
Toyota, Indiana	374,048	300,000	125%	4,659	2,600

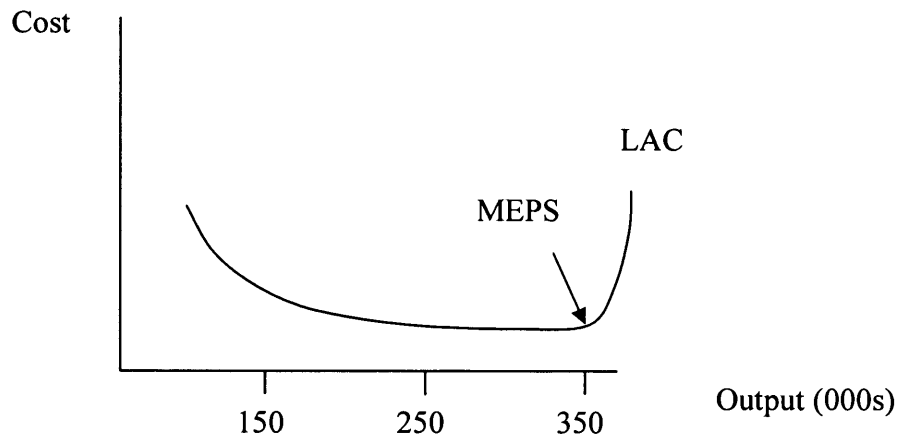
Source: JAMA, 2005a

The results shown in Table 4.7 for capacity and utilisation reveal the problems in making quantitative calculations. Toyota has the highest output yet seemingly lower capacity than Nissan, while Mitsubishi is moribund with less than 50% capacity utilisation. The problem here is that the capacity statement does not take account of the installation investment. Toyota has by far the highest investment in its plant so higher output is only to be expected, implying that the company has installed for the higher output. Nissan may have the physical plant area size to offer higher capacity but the investment suggests that the installation is for lower production. Not only is Nissan's investment markedly lower than Toyota's but it also has a higher labour content,

indicating that the quoted capacity may be higher than the installation could achieve in practice. Mitsubishi's investment is slightly higher than Nissan's but it has recently had to reconfigure its installation to align with lower US sales. The company has reduced the Illinois plant to a single working shift with an output capacity of 140,000 units a year for 3 car models and one SUV (Automotive News, 2004). This accords with Truett and Truett (2003) who found evidence that final assembly was competitive when output was at least above the range of 150,000 to 200,000 units a year. This thesis learned from Mr Sasaki of JAMA that assembly needs to be at least 200,000 units a year to exploit technical efficiencies.

Mitsubishi's output might indicate that 140,000 is the lowest limit for MEPS where the local market is large enough to permit pursuit of industry standard economies of scale, in contrast to Australian plants where they are constrained by the limited local market. However, Toyota did not reveal a marked tendency towards the larger size of powertrain plant (see section 4.3.3 above) so in final assembly, unless there are constant returns to scale as far as Toyota's output, it is likely that there is a shallow downward slope from output of 150,000 units a year to the latest data on MEPS at around 350,000 units a year. It is also reasonable to expect that the gradient of the curve will be particularly shallow after the figure of 250,000 units a year, the approximate capacity of the Toyota plant at Burnaston in the UK (SMMT, 2006b). This is shown in Figure 4.16, below.

Figure 4.16 Economies of scale for final assembly



Due to the greater use of labour for smaller plants it is reasonable to expect that on the increasing returns to scale side of the LAC curve the slope will be relatively shallow. This is because it is relatively easy to design a production line with varying quantities of labour, but only up to a certain point. For example, this thesis found that at Bentley output of 3,500 units per year was viable with a workforce of around 1,000 but this was for a product for which a cost recovery pricing strategy was possible. For mass market production, below 150,000 units a year production would appear almost unviable and beyond 350,000 units a year there will be an overcrowding effect amongst the labour. The production capital will also reach its design limit, leading to a steep rise in diseconomies of scale. Since flexible production techniques mean that final assembly plants can produce a number of models this aids in maintaining production rates, for example the Bentley line currently assembles three variants of the GT. However, if net output capacity exceeds anticipated quantities of market demand then actual output will necessarily suffer, Hyundai's US plant being forced to suspend production for two weeks due to the rise in production of the Santa Fe sports utility vehicle (SUV) being insufficient to offset the drop in production of the Sonata saloon car (Automotive News, 2007c).

4.3.5 Research and development: economies of scale

Research and development (R&D), which includes all the design tasks necessary to bring a product to the point of production, is the source of long-term sustainability for a firm. The overall LAC curve for an industry implies that new products will become available as necessary to fulfil the chosen capacity of plant. Some industries are more R&D dependent than others, the top three highest spending being technological hardware, pharmaceuticals and the automotive industry, with the vast majority of the spending being conducted by companies in the US, Japan, Germany, France and the UK (DTI, 2006).

Although absolute levels of R&D spending reveal the monetary amounts that are necessary to compete in an industry, they do not show the strategic importance that the activity has within a company. For this reason, R&D intensity is usually measured as a percentage of sales (Rosegger, 1987). However, this does not show the relative productivity of R&D, i.e. the efficiency in generating innovations. For this reason R&D should also be related to the number of employees or the number of product lines in order to express R&D efficiency, yet such data is usually considered commercially sensitive.

The data that is available is that of total expenditure since it often has to be declared for regulatory reasons. Even before investigating the data it is obvious that the higher levels of R&D spending will be more affordable for larger companies. There may then be economies of scope as larger firms can spread capabilities across a wider product range and diversification of risk as they absorb instances of failure more easily. Larger budgets may also provide protection from smaller entrants to the industry due to the high barriers to entry created by the absolute R&D spending levels (Thompson and Formby, 1993). Despite this, larger R&D budgets and economies of scope in the product range do not mean that the firms are more efficient and can take firms into diseconomies of scale in the R&D function. Parkin et al. (1997) argue that there may even be a strategic pressure to increase R&D spending as companies compete to bring

new products to market. This suggests that even if the industry might be viable without R&D expenditure, if one company invests then the others are compelled to match it in order to maintain their strategic position. The alternative is the risk that they might suffer disproportionately heavy financial losses should they miss out on a crucial innovation. It is the asymmetry of risk that induces the companies to intensify their R&D spending.

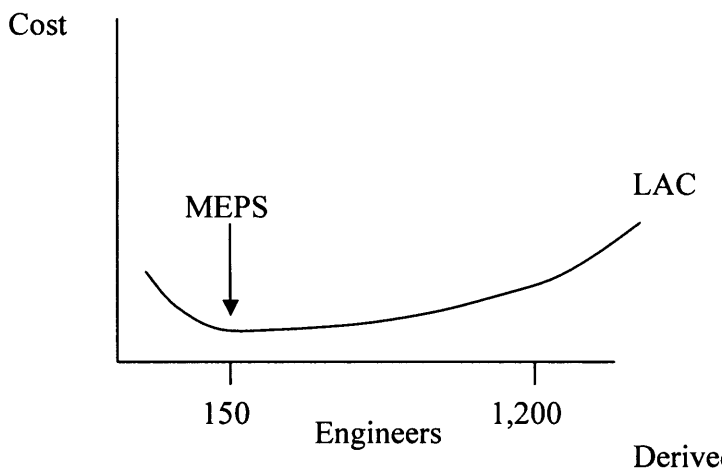
Although there may be sound strategic reasons for operating with large R&D teams this does not negate the existence of a MEPS for R&D, one that could be met by using smaller teams. Cooper (1964) puts forward three possible reasons to explain the greater efficiency of smaller R&D departments:

1. Comparatively higher technical capability in the engineers.
2. Greater personal attention to cost control.
3. Improved communication and coordination.

The research by Cooper (1964) covered firms in a variety of industries. One executive, who was responsible for a large department of over 1,200 engineers, reported that this size of department was advantageous when dealing with large projects for which the personnel could be divided into specialist teams. In so doing, this seemed only to provide further evidence that smaller teams were more effective, although the executive also felt that his department held a breadth of experience that brought economies of scope to larger projects. A distinction should therefore be drawn between R&D functions that are efficient, in terms of achieving economies of scale, and those that are effective in achieving their design briefs, thus benefiting from economies of scope. In order to achieve higher economies of scope in the product range greater product differentiation is necessary, entailing greater use of R&D resources. For R&D to be effective in putting forward diverse products the function may have to grow even beyond its efficient economic scale.

The minimum size of a team depends on the nature of the task and the divisibility of the necessary inputs. It might be possible for a research team to be as small as two, one conducting the experiments and the other writing the reports. For larger projects the research team will have to expand, although coordination difficulties may introduce diseconomies of scale. Since the activity is not machine paced there will be no sudden rise in the cost curve as the equipment reaches its physical operating limits. It is likely, therefore, that the cost curve will have shallow gradients. Cooper (1964) investigated large firms in various industries with different sizes of R&D teams, ranging from 150 engineers up to 1,200 for a large department. Figure 4.17 illustrates these findings.

Figure 4.17 LAC curve for R&D, various industries



Derived from: Cooper, 1964

Figure 4.17 shows MEPS when the R&D team is relatively small, around 150 engineers, with costs rising gradually so that a team of 1,200 engineers has a cost disadvantage, although it may be more effective if the task is large and there is a time constraint. At some point beyond this level costs will rise to a degree that not even the effectiveness of the team is enough to counter the costs and it will be necessary to divide the task between separate teams, perhaps by engaging different companies. The next subsection will evaluate this in a specific industry, that of automobile manufacturing.

4.3.5.1 Vehicle research and development

R&D is one function in an automobile company that eludes decisive estimation of efficiency. It has a complex interaction with the other functions as well as market demand such that it needs to balance economies of scale with economies of scope; the requirement for additional models may push the R&D function into diseconomies of scale. The function includes product concept generation, product planning, product engineering and production engineering (Clark et al., 1987). Development costs are mostly determined in advance so, in theory, the higher the production the lower the proportion development costs will take of the total cost. Dunnett (1980) found that production figures supporting R&D in the late 1970s ranged from "significant" to 5m units a year. Rhys (1999) puts the figure at 2m units a year.

In 2006 there were a number of manufacturers producing less than 1m units a year in total (see Appendix 13) but which maintained an R&D operation. The smallest of these was probably Proton with production of 144,395 units, but with substantial government assistance the company cannot be said to be independent. The Chinese entrant Chery had output of 308,425 units for the year and courtesy of input from numerous external consultancies maintained control of its own R&D. Again, though, this was also with significant political assistance. Subaru is owned by Fuji Heavy Industries, with Toyota as a minority partner, and has output of a little less than 600,000 units a year with its own R&D capability. The smallest standalone producer of passenger vehicles is BMW, all other smaller producers being members of parent groups, and it achieved output of 1.4m vehicles in 2006.

The problem with any output figure is that it is dependent on the demands of the market and the length of the model life cycle. One plan has suggested that the MG-TF sports car would be profitable with sales of 20,000 a year (Autocar, 2005), and with a similar ten-year life cycle to the Mazda MX5 this suggests a total of 200,000 for this model. Of course, with a life cycle of this length it is unlikely that there would be a dedicated R&D team working on successive sports cars. Not only do such niche models benefit

from economies of scope through the production system and into retail distribution, they also benefit from economies of scope in R&D where an engineering team can transfer experience and skills from more mainstream projects. Since design teams move from project to project it is preferable to consider the R&D spending over the entire model range and relate it to sales. Table 4.8 shows this for a selection of global manufacturers for the period June 2005 – June 2006 using data from the Department of Trade and Industry (DTI) in order to show a consistent approach to the figures.

Table 4.8 Global R&D Expenditure 2005/6

Company	R&D Expenditure £m	R&D Expenditure % of sales	R&D Expenditure/employee £
Ford	4659.8	4.5	15,500
Toyota	3726.8	4.1	14,000
VW	2799.9	4.3	8,600
Honda	2308.4	5.4	16,700
BMW	2140.3	6.7	20,700
Subaru	256.8	3.6	9,500

Source: DTI, 2006

It is no surprise that the range in R&D expenditure is wide, but this may be explained by the breadth of the model range. This is particularly the case for Ford which has a large number of light trucks which are classed, and used, as passenger vehicles. Large firms also tend to invest in long-term projects, for example in the case of the automobile industry this would include fuel-cell research. Indeed, interviews conducted with Honda for this thesis found that the company readily promoted its developments not only of automobile related technology, but also robots and jet engines. Although the company claimed that these projects were related to mobility there was no credible connection to the automobiles industry. Other companies were also engaged in research that was beyond the limits of automobile production and might have been indicative of their search for a new manufacturing paradigm. To demonstrate how these additional projects inflate overall R&D expenditure R&D intensity is usually found by relating it to the number of sales it helps to capture, shown by expenditure as a percentage of sales income. This finds that the companies shown in Table 4.8 are quite tightly grouped,

BMW being the heaviest investor and Subaru spending the least for its level of sales. It is possible that Subaru receives a small degree of informal R&D support from its parent, Fuji Heavy Industries, that has not been accounted for.

Table 4.8 follows the DTI surveys in showing R&D commitment by relating total R&D to the entire workforce. This indicates the relative R&D for the different companies by showing that the level of expenditure for each worker. For example, although Toyota's R&D expenditure is 20% lower than Ford's it is only spending 10% less per employee, implying that it is making a greater R&D commitment. BMW makes by far the biggest commitment while VW spends a remarkably low £8,600 per employee.

The discovery that VW is a low R&D spender per employee is difficult to reconcile with its status as a high spender of R&D overall and its dominant position in the retail market. Assuming that the purpose of R&D activity is comparable throughout the industry then by using Toyota as a benchmark, due to its known efficiency in other functions, it might be reasonable to conclude that higher spending per employee denotes a greater efficiency in its investment. Alternatively, it might be the case that VW is able to engage in R&D programmes with a lower expenditure for each R&D engineer. However, VW does have a larger workforce, some 22% higher than Toyota (DTI, 2006) and it is likely that this is weighted towards its production operations in emerging regions. Rates of R&D spending per employee are therefore not a reliable measure of R&D efficiency if it includes employees engaged in other activities.

Companies rarely publish figures for total R&D staff although it may be possible to identify the workforce for specific R&D centres, useful if they have the capability to take a full new model programme from proposal to production. Such centres in the US range from 1300 personnel at Honda to 800 at Toyota, and even as low as 129 at Mazda. Similarly, in the UK, Lotus Engineering, for example, claims to be able to deliver complete vehicle engineering proposals using 1000 engineers, less than Honda employs in the US (Lotus, 2006). This thesis found from interviews that Aston Martin had an R&D strength of 170 personnel and Bentley one of 600, both claiming that this

gave them design authority with detailed assistance on request available from their parent companies. Extrapolation from these figures suggest that a basic model range of around three distinct models might indeed be supported by an R&D strength of around 1200 personnel.

The purpose of R&D is to propose new models so a further measure of R&D effectiveness would be to relate expenditure to the number of models. A broader range of vehicles possibly reflects economies of scope in both R&D and production. However, there are difficulties in simply counting the number of models that each manufacturer claims to produce. Many products share platforms but design differences allow them to attack different market niches. On rare occasions one product range may use model names to differentiate trim levels or brands with very little real difference in design; more commonly one model may be sold under different names for different markets (e.g Mitsubishi Pajero/Shogun). There will also be models that are designed for foreign markets only, such as Honda's joint venture involvement in the China-only Guangzhou Honda model to be released in 2010. Table 4.9 counts the number of models sold according to company reports and websites, although it may undercount where models exist only as part of short production runs or to serve obscure markets. The R&D per model has been calculated from the DTI figures shown in Table 4.8 above.

Table 4.9 R&D expenditure per model, 2005/6

Company	Models	R&D expenditure per model £m
Ford	59	79.0
Toyota	81	46.0
VW	44	63.6
Honda	29	79.6
BMW	11	194.6
Subaru	9	28.5

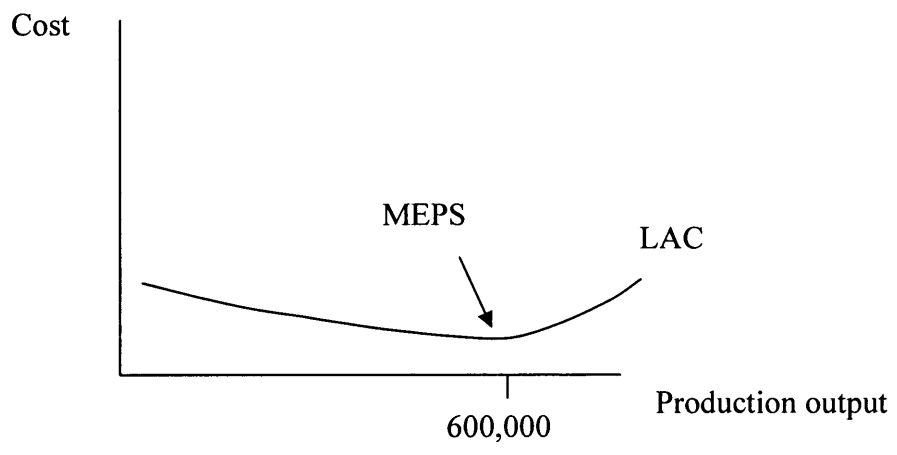
Derived from: DTI, 2006
Company data

Due to the various problems with precisely defining and counting models Table 4.9 can only be an estimate of the R&D spending per model but it does give some indication of how the company strategies relate to each other. It should be noted that Table 4.9 does not show the actual expenditure for particular models since in practice there will be one core model and then a series of variants spun off from it. The figure shown is the average across all those core models and variants. Subaru spends the least per model with nine models based on four platforms, one of which is a light kei-car platform with three variants. From Table 4.9 it would seem that it would cost Toyota, on average, £46.0m to put a new model onto the market whereas it would cost BMW £194.6m. Since Toyota enjoys far higher total sales than BMW (see Table 4.4) it is reasonable to conclude that a low R&D spend per model is an acceptable analogy for an efficient R&D operation. As in a previous estimate of R&D efficiency which related spending to sales Subaru shows itself to be the most efficient.

This research estimates that the MEPS in R&D lies somewhere close to that of Subaru, with the proviso that it might be receiving some assistance from its parent group. Using production data from 2006, the year of the DTI survey used, Subaru appear to show the following conditions for MEPS in R&D to be met: output of 600,000 units per year and expenditure of £256m per year over four platforms and nine models. Since the kei-cars are peculiar to Japan it could be suggested that Subaru has a core range of three platforms and five models in order for it to be comparable as a conventional automobile company. The company is not entirely self-sustaining since it can call on resources within its parent company, Fuji Heavy Industries (FHI) and also Toyota which owns a 9% share of Subaru. Another 2% is owned by Suzuki but this is countered by FHI have a 1% stake in Suzuki. The value of these relationships is difficult to quantify but it would probably offset the subtraction of the kei-car line from the production and R&D expenditure data. This suggests that an automobile company with a similar range of conventional products (i.e. three platforms, five models) would need output of around 600,000 units a year and an R&D investment of around £250m a year. Data from other empirical sources, including interviews conducted for this thesis, suggest that the R&D personnel should number around 1200 engineers.

Figure 4.18 below illustrates a possible LAC curve for R&D based on the level of production output that it both serves and is served by. Since R&D is dependent upon human assets rather than being paced by machinery, the shape of the curve is much shallower than it would be for capital intensive processes like BIW. Up to the optimum of around 600,000 units a year there will be some increasing returns to scale as teamwork effects and economies of scope bring additional benefits. Thereafter, diminishing returns to scale will set in as a crowding-out effect appears. For production output that is higher than 1m units a year it is feasible that multiple R&D centres will be employed. It should be noted that the minimum point appears to have shifted to the right compared to that shown in Figure 4.17 above. This is because an automobile is a complex product and so the R&D team will be divided into smaller groups depending on each aspect of the project.

Figure 4.18 Economies of scale for R&D



Having determined the LAC curves for the four functions at the core of the automobile firm these will now be combined in order to reveal the MES for an automobile manufacturer.

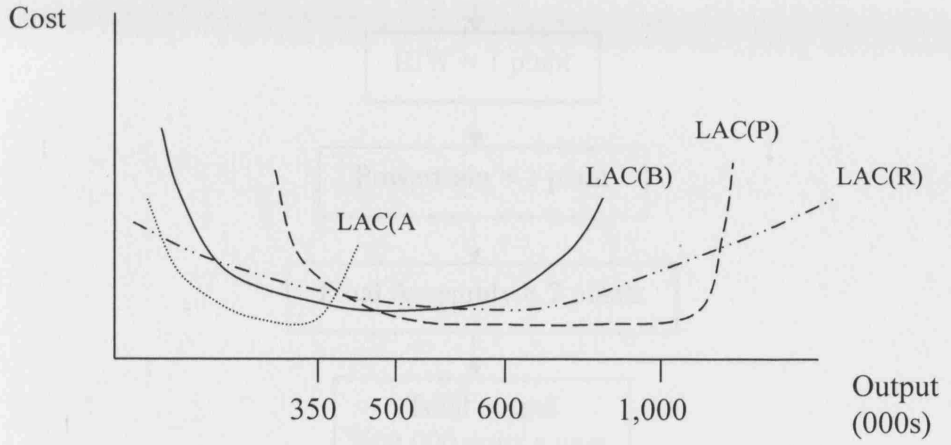
4.4 Combining the LAC curves

From the estimates of economies of scale, both published in the literature and provided by the research interviews, for the three main automobile manufacturing functions it is possible to combine the LAC curves for each function to examine the overall LAC for a car firm as a whole and reveal the MES for the industry. Thus, from the evidence presented in sections 4.3 and 4.4, it is suggested that MEPS for each functions is as follows:

- BIW LAC(B): MEPS = 500,000 units a year
- Powertrain LAC(P): MEPS = 1m units a year
- Final assembly LAC(A): MEPS = 350,000 units a year
- R&D LAC(R) = 600,000 units a year (production), 1200 personnel, 3 platforms, 5 models

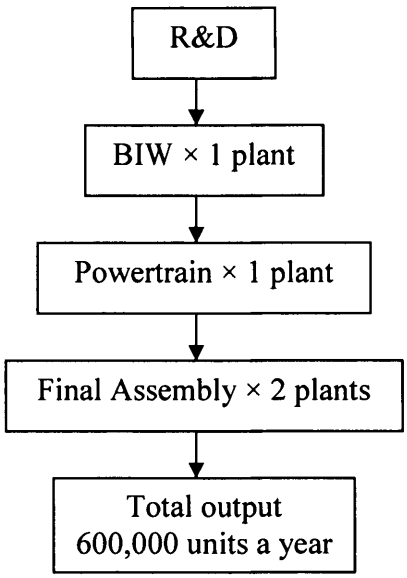
To arrive at an MES output figure for the ideal firm it is necessary to calculate it from the lowest common denominator amongst the processes. This results in an output figure of 21 million units, a result that is nearly half the total global production for 2005. However, each process has a reasonably flat range alongside the MEPS output figure so a visual analysis of the LAC cost curves can indicate an acceptable point for the MES. Figure 4.19 does this by combining the separate LACs for the complete, integrated firm. LAC(B) has been positioned high relative to the cost axis since it is the most capital intensive process, with LAC(P) slightly further down since it includes additional labour in assembly work. Final assembly, LAC(A), where all the parts are brought together, has been positioned lower down the cost axis because it is the most labour intensive. R&D is the most dependent on human assets and so the LAC(R) curve is the flattest, revealing a shallow slope of increasing returns to scale as team effects and economies of scope bring benefits.

Figure 4.19 LAC curves for a prototypical integrated automobile firm



Visual inspection of Figure 4.19 seems to indicate that output at 600,000 units a year results in an acceptable and achievable low level of costs for the combination of functions. It may not represent the absolute optimum, but with only the final assembly plant needed to be duplicated to match the output then it offers a pragmatic solution for the industry. This also accords with the results of the survivor analysis which indicated that the minimum output range for survival was 0.5m to 1m units a year. This results in a company structure as shown in Figure 4.20 below.

Figure 4.20 Automobile company exploiting acceptable economies of scale



In lieu of any manufacturer achieving 21 million units a year, then an output of 600,000 units a year represents, to a reasonable and pragmatic degree, the prototypical MES for the industry, known in this thesis as MES_P. A similar output for MES was also mentioned in an interview for this thesis with automotive analyst Mr Yamaguchi, who put the figure between 500,000 and 700,000 units a year.

Making use of the horizontal tendency in the LAC curves for each process it is possible to have plants working at their full designated capacity, albeit one that is not at absolute measures of MEPS. In this way the schematic shown in Figure 4.20 would represent a prototypical model of an automobile firm with an R&D function at the optimum, a BIW function being slightly beyond the optimum and the Powertrain and Final Assembly functions being operated slightly sub-optimally relative to absolute measures of MEPS. Any cost penalties would be minimised by planning for these outputs, it being common, for example, to find final assembly plants operating at around 250,000 units a year. However, the greater cost penalties emerge when the installed production systems are themselves underused, resulting in a relatively rapid rise in costs on the prototypical firm's SATC curve ($SATC_P$). Figure 4.21 shows how a prototypical firm that planned

for this level of output for achieving MES_P would be vulnerable to fluctuations in demand in the short-term.

Figure 4.21 SATC curve for a prototypical integrated automobile firm

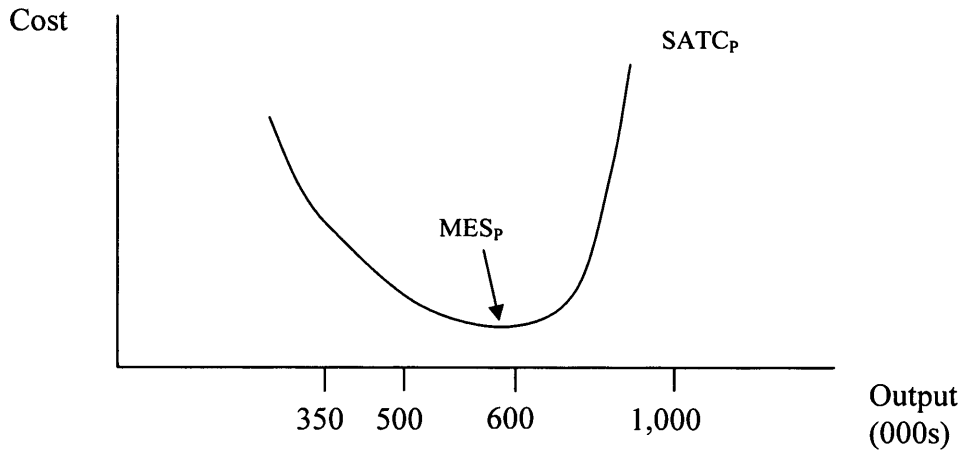


Figure 4.21 implies that firms would incur the greater costs penalties by operating above the minimum, but this can be managed by controlling demand in the form of an order bank or a customer waiting list. Sub-optimal production presents more difficulties in the short-term and demand would be managed using various marketing tactics such as price incentives, a cost that would then have to be balanced with the cost advantage of raising production back towards the MES_P output.

The sensitivity of MES_P to output changes has been foreshadowed in the survivor analysis of the world automobile industry which found that firms producing below 1 million units a year were in a weak position, and indeed this could be extended to manufacturers producing below 2.5 million units a year. At the same time it was difficult to reconcile this with the continuing survival of certain firms within those output ranges, Subaru being a notable example. This is clarified by the sensitivity of MES_P to output changes which would motivate a firm to diversify risk by finding higher levels of output and wider models ranges. The survivor analysis found Toyota to be the industry leader but with output that is nearly thirteen times that of Subaru and

with nine times the number of models. If a Subaru model, such as the Impreza, were to suffer a catastrophic failure in the market such that sales fell by 50% then the 60,000 unit shortfall would reduce total production of the company by 10%. If Toyota were to suffer the failure of a model with the same loss in production then the reduction in output would be barely 0.008% of the total. Furthermore, with 81 model variants on offer it is likely that much of the demand could be transferred to a similar Toyota model rather than being lost to a rival manufacturer

Should such a shortfall occur, Toyota could absorb it by reducing output at one plant while leaving the rest operating at full capacity. This is because Toyota does not manufacture from plants that are thirteen times the size of Subaru's, instead it has a multitude of plants of a comparable size and up to 52 manufacturing companies overseas, even if not all are engaged in automobile manufacturing (Toyota, 2007). Survivor analysis has demonstrated the expansion of production at Toyota, as well as other industry leading manufacturers, and as each new plant is brought on line the company has advanced in steps that can be measured in units of MEPS. In other words, a new assembly plant that is constructed in accordance with MEPS will bring an increased capacity of 350,000 units. For a company like Subaru this would represent an increase in capacity greater than 50% but for Toyota it amounts to just a 0.05% increase in capacity.

Since a new plant must be served by other functions the firm will expand in units of MES, and in the case of MES_P this was found to be around 600,000 units. This may not be strictly necessary if the firm has access to different factor endowments such that it is able to accept different levels of output. For example, this research found Toyota engine plants had output of 500,000 engines a year and final assembly plants had output of 250,000 units a year. The firm could thus expand in steps of 500,000 production capacity units, although actual rises in output may not be this dramatic as it takes time to bring a new plant up to full working capacity. Nevertheless, this clearly demonstrates that increases in capacity for larger firms are much less risky than for smaller firms.

If firms in the automobile industry are expanding in units of MEPS to reduce risk then as they expand output the SATC curve will flatten out in recognition of the reduced variation in cost with changes in output. However, section 4.3.5.1 of this thesis has shown that R&D costs rise significantly as firms gain in size. Figure 4.22 therefore shows the SATC curves for three types of automobile firms:

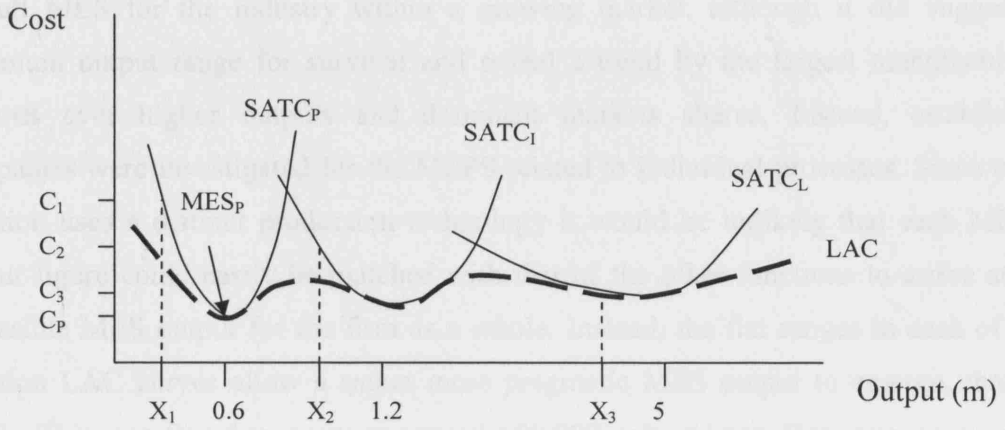
- $SATC_P$: prototypical firm, optimum output at MES_P of 0.6m units
- $SATC_I$: intermediate firm, optimum output at 1.2m units
- $SATC_L$: industry leading firm, optimum output at 5m units

The LAC curve is scalloped around the three firm sizes although it should be noted that other intermediate sizes of firm are available according to the multiples of $SATC_P$. It should also be noted that firms smaller than $SATC_P$ have not been shown but it is assumed the LAC curve rises steeply for these lower output quantities, thus they suffer unsustainable cost disadvantages in production compared to firms at, or above, MES_P.

The LAC curve shows rising costs after MES_P on $SATC_P$ because R&D increasingly experiences diseconomies of scale. In this example, each firm is shown to suffer the same amount of production shortfall from its minimum cost position, the reduced output denoted by points X_1, X_2 and X_3. Since the SATC curves become increasingly flat with the growth of the firm, the costs disadvantages that relate to the shortfall become less marked. The costs associated with the MES_P are shown at C_P, but for output X_1 on $SATC_P$ the costs rise to C_1. For output X_2 on $SATC_I$, the costs are shown by C_2, meaning that the production shortfall has had less of an effect than it did on $SATC_P$. The least affected is the production shortfall on $SATC_L$, shown at X_3, which incurs costs C_3. Not only are these costs barely distinguishable from what they might have been at the minimum cost output for this curve of 5m units, but they are very close to the costs associated with the MES_P for the industry. This shows that although larger firms incur cost penalties in R&D and, moreover, are unable to achieve their minimum cost output because it would be almost impossible to have a multitude of factories all operating at full capacity at the same time, the shallow slope of the SATC curve means

that they are able to remain close to the optimum for the industry despite variations in output.

Figure 4.22 SATC and LAC curves for automobile industry firms



It is this ability of larger firms to remain reliably close to the minimum costs for the industry that allows them to benefit from an influx of revenue. For example, although Subaru is a profitable firm, its net operating income for the 2007 financial year (ending March 2007) amounted to £44.4m, whereas for Toyota in the same period, net operating income amounted to £7.0 billion (source: company reports). Expressed as net operating income per unit, Toyota earned £909 per unit and Subaru earned £74 per unit. Of course, this is a single sample and other years might show less of a difference, nevertheless the difference is wide enough to be indicative. It should also be noted that there are cases where large firms, despite the diversification of risk, suffer a multiple failure which incurs heavy production and financial losses which can only be addressed by multiple plant closures to realign the company on a new SATC curve; the restructuring that has taken place at companies like Ford and GM would be a case in point.

4.5 Conclusion

This chapter has described how the presence of economies of scale for the four main functions in automobile manufacturing is expressed as MEPS for plants and MES figures for integrated companies. Survivor analysis did not conclusively identify an overall MES for the industry within a growing market, although it did suggest a minimum output range for survival and reveal a trend by the largest manufacturers towards ever higher outputs and dominant markets shares. Instead, established companies were investigated for the MEPS related to individual processes. Since each function uses a distinct production technology it would be unlikely that each MEPS output figure could easily be matched with that of the other functions to arrive at an accessible MES output for the firm as a whole. Instead, the flat ranges in each of the function LAC curves allow a rather more pragmatic MES output to emerge, that of MES_P. This was found to occur at around 600,000 units a year. However, companies operating at such a level of output are sensitive to changes in output which lead to rapidly increasing costs. Larger companies are less susceptible to the onset of these increased costs since they can diversify the risk across larger numbers of products and plants. Output higher than MES_P is therefore a strategic move to reduce risk rather than a search for further economies of scale. Indeed, rising R&D costs beyond MES_P indicate that larger firms may be suffering diseconomies of scale but ones that are countered by the flattening of the SATC curve as output capacity increases.

There is nothing in the foregoing to suggest that a company is compelled to combine all four of the automobile manufacturing functions. In attempting to bring together the LAC curves for each function a company might consider instead focusing only on those functions where it felt it had the advantage. Generally, though, this does not happen and only the smallest of manufacturers operate with only three or less functions. Since this cannot be explained by economies of scale, which are concerned with technical efficiencies, the next chapter of this thesis will investigate the reasons behind vertical integration of the four functions.

Chapter 5:
Structuring the Automobile Industry Paradigm

When a function is internalised the relevant economies of scale then become the responsibility of the parent company but this does not have a material effect on the quantification of the cost benefits of scale. For the purposes of the generic model being constructed by this research the argument is clarified by keeping the two concepts separate. The preceding chapter set down the principles of scale and demonstrated how these determine the size of automobile industry. In particular, that for a given production process, one using a specified production technology, only a predefined production output range can make the most efficient use of the factors of production. Chapter 4 demonstrated these output ranges for each function based on data gathered from the literature, industry sources and fieldwork interviews.

In order to demonstrate how automobile companies are structured this chapter is divided into two parts. In Part I, transaction cost analysis will be investigated as a mechanism for explaining the inclination of firms to vertically integrate. This will include the cost advantages of internalising functions and how they might be managed within a governance structure. In Part II, the automobile industry will be used as an example of how structural considerations can lead to a standard prototypical organisational form of vertical integration for a car firm. Chapter 4 can then be drawn on to provide the sizes of plant that are included within each internalised function. Since the considerations of size and structure prescribe a basic type of automobile company, one with defined limitations and potential, this thesis terms it an automobile industry paradigm. This chapter will conclude with empirical evidence gathered during the fieldwork phase of this research in order to contextualise the theoretical arguments.

Part I: Company Structure

In Part I, transaction cost analysis (TCA) theory will be examined as a structuring approach to the economics of business relations. This concerns the "make-or-buy" decision, whether to produce in-house as part of a firm's hierarchical structure, or else to buy from another firm through the mechanism of the market. The market relationship is governed by bilateral contracts formulated *ex ante* but which cannot account for all future contingencies. Consequently, the market relationship may suffer from *ex post* opportunism or hold-ups when benefits accrue disproportionately to one of the parties. The economic costs of this can be likened to the friction between the parties, specifically economic friction in this situation. In order to overcome this friction one party may vertically integrate the other into its hierarchical structure. In a mature and global industry, where these business relationships may be a common feature, transaction cost analysis suggests that there is an optimal structure for firms that are using the same production technology.

A firm's structure is designed to minimise the costs of company functions working with each other. The purpose is for a firm to achieve the same, or better, minimum costs as its rivals. As David and Han (2004, p.40) summarise:

"The theory's central claim is that transactions will be handled in such a way as to minimize the costs involved in carrying them out."

Cost is therefore the deciding factor behind 'make-or-buy'. Harrigan (1986, p.536) suggests that there may yet be a third motivator to organise, not just 'make-or-buy' but 'diversify'. The author characterises diversifying vertical integration as being one that takes the company beyond its core capabilities. This, though, seems to be more a problem of semantics than organisational theory. If integration is to be vertical then it must take the firm outside its established area. When it is part of a diversification strategy benefiting from managerial economies of scope then, at best, it is horizontal integration and at worst it does not involve transactions at all. In order to define when transaction costs are relevant David and Han (2004) list three ways in which transaction costs are manifested:

- Asset specificity – the degree to which assets may be redeployed.
- Uncertainty – the predictability of *ex ante* outcomes.
- Frequency – how often the relationship needs to be renegotiated.

This chapter will show that by an historical process of consolidation these considerations may culminate in vertically integrated firms based around their main functions. Since the degree of vertical integration has unlimited potential the term 'fully vertically integrated' is a nebulous one. In order to confine the discussion to the defining functions the comprehensively vertically integrated firm will be said to be structured in accordance with the forthcoming proposal, the full-function model. This is to obviate comparisons between firms operating at different levels of scale which have the opportunity to integrate with a multitude of peripheral firms. Vertical integration here is not about absorbing quantities of external resources but about internalising the core functions that define an industry.

5.1 Vertical integration and the full-function company

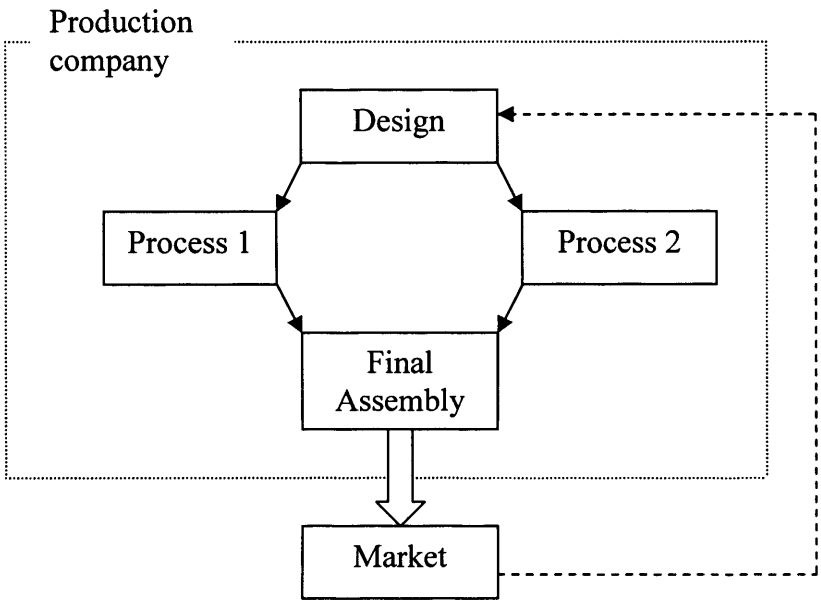
When a company takes more responsibility for production processes by internalising the supply chain it is said to be increasingly vertically integrated. A vertically integrated manufacturer is one that has internalised all the major functions of production, although sub-components and raw materials may still be supplied from external sources. Horizontal integration is concerned with economies of scale, such as the scope of products and the quantity of output, while vertical integration is concerned with the number of production stages included within the firm (Cabral, 2000).

Vertical integration is a relative term because it depends on the degree to which processes have been internalised and so complete vertical integration would be difficult to achieve since it would include even the processing of raw materials. The minutiae of vertical integration are not the focus here, though the exposure to the concomitant economies of scale is relevant. For this reason, companies that operate the main manufacturing functions, and are therefore exposed to the attendant economies of scale, will here be termed 'full-function' rather than vertically

integrated. In effect, the production process is being treated as interconnected modules of discrete production activity, each with its own inherent economies of scale, as described in the previous chapter.

Figure 5.1 illustrates the company boundary of a typical full-function company with four modules of production. The product originates in the Design function and is put together in the Assembly function. The product is made up of two components manufactured in two technically unrelated processes, Process 1 and Process 2, though a more complex product would require more processes. Each process is analogous to a production plant, although in practice the plants may be multiplied. The final products are released to the market which is, of course, external to the functional operations of the company, though information from it is fed back to the company's Design function by way of a marketing capability.

Figure 5.1 Typical full-function producer



A furniture factory, for example, might have a process for manufacturing wooden frames and another for the soft fabrics, there being no technical commonality between the two. The manner in which the major functions relate to each other is a key element in the structuring of the company, initially as to whether the functions should be internalised and then the level of output for each. Concerning internalisation, transaction cost analysis is an instructive method for comprehending the resultant

vertical integration structure of the company. Outside of the company's boundary lie the suppliers with which the company has a market-based relationship.

5.1.1 Component supply industry and functional relationships

A multi-stage production system involves inputs from a myriad of component suppliers. Even for a full-function firm operating in multiple core areas there will be component suppliers contributing at the sub-functionary level. These range from small individual parts to larger sub-assemblies that are built up from a collection of components. The completed sub-unit is then fed into the main assembly line.

The firm is in a vertical relationship with a supplier if their contribution is at a prior stage in the sequence of the production transformation process, thereby enabling the firm to complete its work. The part being supplied would therefore have to make a unique contribution to the production process, if it were duplicating a current activity at the firm the relationship would be one of 'tapered integration' (Cabral, 2000). Between different suppliers the relationship is horizontal if they are producing broadly the same product. In terms of integration, it is vertical integration when a producer internalises a supplier of complementary parts and it is horizontal integration when the absorbed company is supplementing a current capability. Horizontal integration is particularly pertinent in international growth when a foreign supplier is absorbed in order to secure component supply at the new location in place of components sent from the home base.

The varying levels of integration between suppliers and producers are illuminated by the range of relevant factors stated by Odaka *et al.* (1988). This includes technological distinctiveness of the part, production technology, demand and economies of scale. Components may use a unique technology or may be an item that is common to other industries. Walker and Weber (1987) then list three costs that arise in the buyer-supplier relationship:

- Switching costs incurred by the buyer when changing supplier.
- Adjustment costs incurred by the supplier when changing the product or output.
- Transaction costs due to opportunistic behaviour by the supplier.

For generic components the firm has purchasing power and can switch suppliers for a relatively low cost. This might be termed a low dependency relationship and one that can be controlled by the mechanisms of the open market. High adjustment costs occur when the supplier has specialised to the buyer, thereby introducing specificity in the transaction, but the supplier can also use this position to hold the buyer hostage to the relationship. For example, in fuel cell vehicle development Honda first purchased fuel cell stacks from Ballard of Canada for the FCX V1 in 1999, but began developing its own independent technology at the same time for the FCX V2 vehicle. Perhaps one of the most famous cases, though, was that between GM and Fisher Body during the period in the 1920s when the car industry moved into the Budd Paradigm style of unitary body production. This will be discussed more fully later in this chapter.

Not only can opportunistic behaviour and adjustment be seen as categories of transaction costs but so too can switching costs. Transaction cost analysis is concerned with all the costs that arise in managing the relationship between buyer and supplier, culminating in the 'make-or-buy' decision. The transactions between buyer and supplier are governed by contracts, but these cannot be written in such a way that all the contingencies are accounted for. Transaction costs therefore arise due to the element of risk and uncertainty that create economic drag or friction, expressed as costs.

5.1.2 Transactions as mechanical friction

The transaction cost model involves the transfer of knowledge and resources under a system of ownership controls. Simply put, the firm will expand the scope of its activities to a point where the cost of an activity carried out within the organisation equals the cost of conducting it with an external organisation. The purpose is to minimise costs across separate technologies either by integrating activities or

contracting with external organisations (Williamson, 1998). These costs are not necessarily quantifiable:

"Unlike production costs, transaction costs are very difficult to measure because they represent the potential consequences of alternative decisions." (Klein *et al.*, 1990, p.197.)

Dealing with another organisation brings with it additional costs, such as the information search to find the appropriate partner, bargaining costs in arranging the relationship and finally administration costs in the course of the relationship (Viitanen, 2002). The relationship is governed by mutually agreed contracts and the externalities can be summarised as follows:

- Search costs
- Contracting costs
- Coordination costs

Although information technology (IT) improvements have reduced relative costs of external resources this is a contributory factor and will not necessarily eliminate altogether the costs of administering an external relationship.

Transaction cost analysis focuses on the links between different functional activities. The point of delivery represents the interface between the supplier's and the producer's assembly process, regulated by formal statements of the bilateral relationship. When the supplier delivers the components right up to the assembly stations this brings the point of delivery into closer proximity but it does not change the fundamentals of the supplier-producer relationship. Should the assembler find that by looking at the costs of this relationship that it could achieve lower costs by absorbing the component production within the company then this would suggest the need for increased integration. Levy (1985) was of the opinion that integration was a logical outcome of working in close proximity because it realised flow economies through a highly transaction specific relationship. However, this does not necessarily change the physical nature of the component production and supply since JIT (just-in-

time) supply is not reliant on internalisation, although it may open possibilities to subsequent innovation. When transaction cost analysis leads to increased integration it is done to reduce the costs of contracting with an external organisation, not to change the nature of the processes.

Choosing to integrate the processes within the firm does not mean that there has occurred a market imperfection, the resources are still available externally, but it does represent a failure of the market to provide the most cost effective structure. In essence, the industry and the product remain unchanged. Williamson (1981) made the point that transaction costs are the economic analogy of mechanical friction between moving parts, they are the drag that occurs when transferring between activities, and this has been reiterated by subsequent researchers such as David and Han (2004). The activities are technologically separable goods and services, the transaction being the transfer process. The point could also be made that technological separation implies that different economies of scale are available for these activities. However, the interest here is not with the internal costs of each process but the costs arising between processes. Like David and Han (2004), Williamson (1987) puts transaction costs into three dimensions:

- Frequency
- Uncertainty
- Specificity

Williamson places the emphasis on the last two. Contracts serve to control the transfer between the principal and agent, for example between the assembler and the component supplier. Uncertainties result from "human nature as we know it" and the risk is heightened by the degree of commitment, or specificity, of the assets (Williamson, 1981, p.553). While the market offers the freedom to find business relationships, contracts are needed to control the form of the relationship since Williamson assumes that human nature will play a central role.

5.1.3 Contracts and the market

The behavioural assumptions Williamson (1981) has in mind are the bounded rationality of agents acting within available knowledge, and the tendency towards opportunism when new knowledge emerges after the contract has been agreed. If all relevant information were known then complete bilateral contracts could be written *ex ante*, but this not being the case no contract can be formulated to cover all possible contingencies. This is exacerbated by the human desire to exploit subsequent advantages when they accrue asymmetrically to one of the parties, giving rise to an *ex post* opportunist situation where one of the partners can exert power not accounted for in the original contract. One form of opportunism is the hold-up, where the owner of the relevant assets threatens to withhold supply in order to extract terms more favourable to its operations. For Williamson, opportunism is the main reason for attempting to regulate business through contracts or vertical integration.

"But for opportunism, most forms of complex contracting and hierarchy vanish." (Williamson, 1993, p.97.)

Williamson is perhaps displaying an overly negative opinion of human nature, and concedes that transacting parties are usually "well-socialized" enough to economise on transaction costs to a degree. Furthermore, an incomplete contract is also one that has an inbuilt flexibility that might yield unforeseen innovations. A rigid contract can bind two firms together when economic efficiency would be better served if they dissolved their relationship (Tirole, 1989). This may be unwittingly entered into, as Williamson (1993) suggests:

"...opportunism is more often suppressed unknowingly or selectively and that, once done, the ramifications are rarely assessed." (Williamson, 1993, p.100.)

For Klein (2000) there is another, implicit, way in which the incomplete contract can be confined. If the benefits of reneging on the contract are offset by damage done to the offender's good name, what can be termed its 'reputational capital', then the contract is costlessly self-enforcing. This is an attractive proposition for a company because internalisation also has costs. When a company absorbs a supplier it is, by

definition of the relationship, expanding into an industry in which it previously had little or no experience and may push the firm into diseconomies of scope. Although the information search costs in seeking suppliers are being reduced by such a move there then appears an opportunity cost in forgoing engagement of suppliers in the future that might have been more suitable. In a sense, the producer becomes locked-in to a supplier that may not provide the greatest benefits. This may be accentuated during a time of fast moving innovation, the period of uncertainty described by Williamson, when another supplier may unveil a development of considerable impact.

The foundation of this dichotomous decision making, integration of resources or finding those resources in the open market, is the nature of the market itself. However, there are difficulties in defining precisely what shape the market takes. Ankarloo and Palermo (2004) restate Williamson's assumption on the primordial existence of the market, with zero transaction costs acting as a reference point. Since such a utopian state can only be aspired to, due to the human frailties described by Williamson, then contractual relationships introduce transaction costs. The concept of the firm is then defined by its boundary of contracts linking it to the market. This is suggestive of a sense of evolution from the pure market to one that deals with inevitable, if unpredictable, market failures. Ankarloo and Palermo dispute the dichotomy, pointing out that the market basis does not explain the existence of economic institutions like firms since Pareto efficiency can be achieved by a centralised and formal allocative model that a government controlled economy would provide. This is a problem for Williamson's theory since he refers his theory of the firm, and transaction costs, to the failures of the market. If an alternative to the market exists then there are reasons for firms to exist other than to deal with transaction cost problems and market failures.

Ankarloo and Palermo's Marxist polemic does not actually rule out a role for transaction costs but they introduce a third element to refute the market-firm dichotomy. This is the regulatory function of the state to legislate a framework for markets and the manner in which companies should be permitted to operate within them, yet the authors seem unaware that this is simply an institutionalised version of the contract. Moreover, since the functions of the state need to be paid for, any state promulgated regulations bring with them their own costs, thus reinforcing the idea of

market failure and transaction costs. Klein (2000, p.127) illustrates this when he states that referral of a contract in dispute to a third party introduces a time lag and the need to communicate the minutiae of the contract results in "increased noise". These costs are avoidable when a self-enforcement mechanism exists, such as when the renegade firm risks injury to its reputation or "transactor's reputational capital". Klein notes that this is particularly effective with large contracts.

To take the contracting process out of the hands of the contracting parties and utilise the services of a regulatory intermediary is simply to politicise the existing process, it does not create a third alternative to the market and the firm. It is a fundamental point that for a government to regulate a system of contracts, which is in itself already a form of regulation, is either to add another layer of regulation, or at least create the forum where the contracts are formulated, but it does not provide an alternative to the necessity of making contracts. It hardly matters whether the primordial market ever existed or is an "expositional convenience" used by Williamson (1975, p.20). Conversely, it would be quite impossible for the concept of the firm to predate the market unless all economic activity had begun with one universally integrated firm. Williamson states that it would even be possible to start from a theoretical position of primordial central planning, the point being made is that economic friction caused by bounded rationality manifests itself as transaction costs. The purpose of the firm, then, is to internalise the transactions and so reduce the costs, thereon expanding until the costs of the internal transactions are equal to or exceed the costs of external transactions between firms. The market is simply the external relationship between firms, not an institution in itself. Moreover, the market is not defined by the medium of the transaction, although money tends to reduce transaction costs in comparison to barter since it is usually mutually acceptable (Williamson and Wright, 1994).

5.1.4 The imperfect contract

Williamson (1975) looks at the market as a theoretical starting point but cannot define its exact nature because, as the antithesis of a contractually controlled system, the market is unstructured and unpredictable. If the market were predictable then contracts could be perfectly formulated to cover all contingencies. The choice companies face is between internalisation of resources into an integrated hierarchical

firm or finding those resources in the market and regulating them by contracts. The transaction cost approach is not derived from some poorly defined notion of the market but has varied antecedents, namely organisation theory and contract law, in addition to economics (Williamson, 1981, p.550). These three are indivisibly interrelated, a contract being written by participating organisations in order to gain some control over the economic friction between them.

Concerning contract law, Klein (1980, p.356) underlines the basic problem of contracts, that:

"...complete, fully contingent, costlessly enforceable contracts are not possible".

This is stated without direct reference to the market because contracts are made as security, however limited, against the other party's failure to act in accordance with expectations. Slater and Spencer (2000) discuss the difference between uncertainty, which is unknowable, and risk, which may be calculated for by the transacting parties. Yet the insurance industry is able to calculate premiums without having to make a fine distinction between the two concepts, so it could be suggested that from the perspective of transaction costs theory the difference is mainly semantic. In any case, Klein (1980, p.357) does not express a need to distinguish the two:

"Contracts can be usefully thought to refer to anticipated rather than stated performance."

Two reasons are given for no contract being complete: firstly that not all contingencies can be accounted for; secondly that performance is difficult to predict. Specific reference is even made to Williamson's warning about "opportunistic behaviour". This is a reminder that transaction costs and contracts are formulated with reference to the behavioural issues of economics and organisations, not the conditions of a theoretical original market. Klein (1988, p.202) takes this further, showing that long-term contracts, while they are partially enforced by reputational capital, a large enough shift in the demand or supply characteristics will move the "contractual arrangement outside of the self-enforcing range". Although investments specific to the business relationship require long-term contracts for security, far from enforcing

the relationship this actually creates the conditions for a potential hold-up, albeit one of unknowable source *ex ante*. It is the nature of this specificity that is relevant to the necessity for vertical integration.

5.1.5 Specificity

Klein (1980) particularly focuses on the risks involved when firm-specific investments are made since the firm making them can be held hostage by its contractual partner, which can then exploit its advantage by appropriating the quasi-rent stream. The investing firm has most to lose due to the difficulty in transferring the investment, whereas the renegade firm has most to gain, at least in the short-term. Williamson (1981) also stresses this point, preferring the term "asset specificity", but supporting the view that increased specificity brings higher risks and therefore more significant transaction costs.

According to Williamson (1981, p.555) specificity can occur in three ways:

- Site specificity
- Physical asset specificity
- Human asset specificity.

The specificity requires commitment since it is derived from the value of an investment being higher for the relationship in question over any other. For example, the fast-food chain McDonald's operates restaurants with franchise arrangements. The main physical assets are the restaurant buildings with brand specific architecture and interior design. Since these are important in projecting the appropriate corporate image the company retains control of them by owning them. This power is partially countered by the franchisee's power to withhold service standards set by McDonald's, the franchisee having the potential to profit from cost savings that accrue to their part of the business but which are damaging to the corporate business as a whole (Milgrom and Roberts, 1992). McDonald's is therefore careful to put in place a system of incentives and penalties to support the contractual relationship. Lieberman (1991) found strong empirical support for integration by firms that carried significant sunk

costs due to asset specificity and anxiety about being "locked-in" to a business relationship. Lyons (1995) also found asset specificity to be predictive of vertical integration in UK engineering firms.

Additional specificities that are derived from the three mentioned above have also been put forward. Williamson (1983) included dedicated assets which are generic in nature but specific to the particular transaction and might have been put in place in expectation of new business. This being the case then, as far as the transaction in question is concerned, they have the same risks for the supplier as physical asset specificity, should the deal fall through the assets have less value when applied elsewhere. Joskow (2003) puts forward the idea of intangible asset specificity as would be contained within a brand image, giving the example of McDonald's fast food chain. Again this is derivative and aspects of it appear in human asset specificity (service) and physical asset specificity (restaurant décor). It is also covered by the reputational capital described by Klein (2000).

Masten *et al.* (1991) add temporal or time specificity where a supplier of a time sensitive product gains progressively greater power over the buyer as the deadline looms. It is notable that defence contracts in the UK often detail penalties to counter this hazard, the most recent example being the overruns on the Nimrod reconnaissance aircraft giving rise to a £500m penalty against manufacturer BAE Systems by the British government (Sunday Times, 2006). High temporal specificity also occurs on a sequential production line where a stoppage at one place causes the entire line to halt. Joskow (2003) believes this to be a sub-category of site specificity. Indeed, specificity as a concept is most comprehensively covered by the site, physical and human specificities originally set out by Williamson (1981), the derivations being useful in explaining the nuances of particular instances.

5.1.6 Site asset specificity

Site specificity anchors an industrial activity in a particular location due to the pre-existing characteristics of the site. This can be taken to mean the natural resources as a factor of production, but as Joskow (1985, p.38) puts it:

"...buyer and seller are in a 'cheek-by-jowl' relation with one another".

Historically, industries were usually tied to a particular location due to the reliance on natural resources and poorly developed transportation. Sheffield rose as a steel town due to the proximity of iron, coal and local rivers for water power. Once the industry was established it took on Joskow's more sophisticated definition of site specificity based on external economies of scale, attracting developments in steel making due to the industrial infrastructure as much as the natural resources:

"...reflecting *ex-ante* decisions to minimize inventory and transportation costs" (Joskow, 2003, p.14).

Nuclear power stations also need a readily available supply of water but they tend to be located in less populated areas. This avoidance of a particular factor, rather than attraction to it, might be termed 'negative site specificity'. Once operating, though, a second nuclear power station can be built in juxtaposition, yet the two power generators are not in a buyer-seller transactional relationship. The proximity of the second station is due more to reasons of economies of scale and political issues, including the original negative site specificity.

With advancements in transportation links political pressures can often be the deciding factor in site specificity. UK government policies have influenced choice of location, from intervention by way of the Industrial Development Certificate of the 1960s (Adeney, 1988), to inducement by way of financial incentives later in the 1980s and beyond (Garrahan and Stewart, 1991). In effect, this altered the price of factor inputs. However the policy of the 1960s showed that while government policy could be instrumental in locating manufacturers it was not the sole motivator and the long-term success was not one that could be reliably predicted. Jaguar avoided having to move by taking over Daimler's Browns Lane plant in 1952 (Underwood, 1989). This plant continued in production for a further fifty-three years before it was found to be uneconomic in comparison to the other Jaguar sites at Halewood and Castle Bromwich, at which point it was closed as a production facility.

5.1.7 Physical asset specificity

Physical asset specificity concerns the degree to which capital investments are firm specific. Williamson (1981) tells us that asset specificity is the most important element in transaction costs, the less specialised the assets the fewer the hazards. When specialised facilities are installed then the relationship between the buyer and seller becomes "locked in" with both parties interested in the longevity of the contract. In a survey of hospitals, Coles and Hesterly (1998) concluded that specialised equipment that could not be transferred to other hospitals, because it was configured for a service unique to one hospital, was defined as a specific asset. Physical asset specificity can therefore be contingent on the service being offered, it being possible to offer a reduced standard of service with standardised capital equipment. However, Williamson's perspective on this is that once the more specialised medical equipment is installed it is then in the interests of the surgeons to remain with the equipment, based on the rational assumption that this would result in a higher quality of service.

Coase was not so impressed by the impact of asset specificity, noting that businessmen he spoke to in 1932 did not attach great importance to it since they could arrange contracts that took care of their concerns. He claims that:

"...contractual arrangements were able to handle the asset specificity problem in a satisfactory manner" (Coase, 2000, p.18).

The views of Coase and Williamson are not necessarily irreconcilable. Williamson is taking a holistic perspective, *ex ante* to *ex post*. Entering into an asset specific transaction carries higher risks than if standardised, transferable assets were used. Early on in the relationship hold-ups can be enacted as the holder of the assets is able to exploit their position to extract concessions from the purchaser. Once the relationship is stabilised, Williamson believes in the longevity of the relationship, a phenomenon that Coase observed *ex post*. Specific physical assets appear to create high entrance and exit costs which have to be assessed *ex ante*, but this also brings stability to the relationship once all costs have been accounted for, and as Williamson states (1993, p.105):

"...the wise prince is one who seeks to both give and receive credible commitments".

This also acts as a reminder that transactions and contracts are aspects of human relationships, indicating that human asset specificity might have a crucial role.

5.1.8 Human asset specificity

The unique knowledge and skill that is dedicated to the transaction is of human origin, hence human specificity. Coles and Hesterly (1998) draw a distinction between human asset specificity which links the person to a unique service, and general human capital which is transferable between organisations. The example they provide is of assistants who provide a service tailored to the particular needs of the surgeons at that hospital, a unique service that might not suit surgeons at another location. Human asset specificity is therefore inherent to the supplier and the buyer can exploit this if there is a credible alternative source of supply. The supplier would then find that the knowledge accumulated could not be transferred to another buyer and obtain the same value.

Since the asset itself resides within the worker they are also in a position to cause a hold-up. Joskow (2003) gives the example of the special skills that aircraft designers accrue through experience, but it is quite feasible that these designers could withhold their labour if they believed they were not being adequately recompensed (Williamson, 1981). This represents an opportunity for the "appropriation of quasi-rents" (Klein, 1988, p.199). Klein believes that this situation is peculiar to human assets, indeed that the entire 'make-or-buy' decision is actually a choice between the physical making of products and the buying of knowledge, not between internal integration and outsourcing. A firm does not need to own its physical assets to use them for production, and Klein gives the example of a firm not owning the offices in which it works. Furthermore, the entire production transformation process is replete with physical assets any one of which has some potential to be the source of a hold-up. However, whatever the extent of ownership of the physical assets, the human assets that operate them can never be owned in the same way. It is solely through owning the labour contracts that a firm can have a claim on the human assets, and the

contracts detail the extent of those claims. This definition of output by contract is also applicable to physical assets, which is the basis of the outsourcing agreement, but the owner of the physical assets has additional discretionary powers over the asset.

Klein (1988) asserts that in a free world the human assets are at liberty to seek employment elsewhere since humans retain discretionary powers over themselves, notwithstanding the details of the labour contract. This might threaten the sustainability of the firm but as long as key personnel remain then the knowledge embodied in the human assets will perpetuate within the organisation:

"The employees come and go but the organization maintains the memory of past trials and the knowledge of how to best do something." (Klein, 1988, p.208.)

Klein describes this as ownership of the firm's organisational capital, which is embedded in the human assets. The human asset specificity lies with the organisational capital and so vertical integration internalises this organisational capital even if the number of labour contracts compared to the market remains constant. The great advance for the firm is that it is no longer bound to *ex post* consequences of the contracts because any advantages that accrue disproportionately to the human assets also accrue to the firm through its ownership of the organisation capital. Klein (1988) believes that even if some employees can threaten a hold-up by resigning, the organisational capital remains in place with the key personnel that stay.

Like all transaction cost analysis this is a 'make-or-buy' dichotomy, internal flexibility still foregoes the flexibility of accessing more widely spread human assets in the market, so the choice is based on relative costs. Nevertheless, within existing labour regulations the integrated company can make adjustments to plant locations, production output and other tangible assets because it owns the labour contracts of the workers that operate those assets. The transaction costs that the integrated firm saves are in negotiating and renegotiating these contracts at the same time as avoiding one overarching, yet rigid, contract between two separate firms. This concords with the views of Hart and Moore (1990) concerning the property rights theory of the firm, which is more specifically based upon the ownership of physical assets, where the authors conclude that an integrated firm can shed workers selectively, but when

contracting with another firm it is the whole firm that must be "fired". However, by taking a strictly physical asset view of the firm, it is difficult for the property rights theory to account for the opportunism of human frailty:

"Surely integration does not give a boss direct control over workers' human capital, in the absence of slavery?" (Hart and Moore, 1990, p.1150.)

Klein's insight into the ownership of the organisational capital through the employment contracts deals with this control issue and has crucial importance for knowledge intensive processes such as design work. Where the knowledge is at the core of the firm's operations then it needs to secure the services of those human assets that carry the knowledge, at least in high enough numbers that the knowledge is perpetuated within the organisation. If the value of this knowledge is high enough it can push other cost considerations, such as economies of scale, into a distant second place. Klein also argues that the same principle can be applied to the physical assets since knowledge is required to operate these too. While this may be relevant when the production technology is in flux during a time of rapid development, where the technology is mature but capital intensive the switching costs of the physical assets come to the fore. The implication of this is that companies made up of processes that are, separately, knowledge intensive and capital intensive, will vertically integrate those processes for different reasons: the human assets to secure knowledge, the physical assets to secure production.

As Klein points out, the securing of human assets cannot be done by direct contract and so additional incentives become the key for securing access to them. Holmstrom and Milgrom (1994) explored the complexity of incentive systems within firms. Since the monitoring of output from human assets is "complex and costly" recourse is taken to monitoring the output from physical assets and basing incentive schemes on that. In this way workers can be rewarded for production output and so it is in the interests of the firm owner to secure a better bargaining position through being the owner of the physical assets. This becomes more problematic when the output is dependent solely upon the human assets, such as in design work. As Poppo and Zenger (1998, p.859) show, the difficulties in achieving this through a market mechanism encourage firms to internalise knowledge-based activities:

"Markets, by contrast, lack the capacity for such managerial intervention: when measurement is highly problematic, markets simply fail."

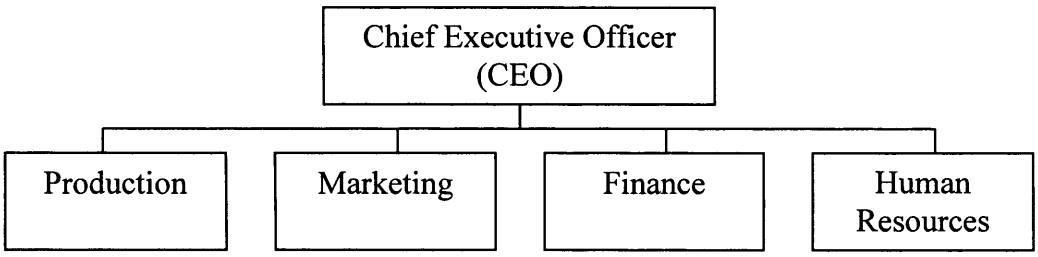
Internalisation is, therefore, a system for gaining control by the management through ownership of labour contracts. This internalises knowledge generation into the firm's hierarchical structure and so it gains some measure of control over it. Any unforeseen benefits that emerge, such as new product innovations, accrue to the firm through its ownership of the labour contracts. Although this has to be balanced with the loss of access to innovations occurring externally, and by definition innovations are unpredictable and of unknowable source, internalisation of human assets means that they can be treated more like physical assets. Output, though, is more difficult to quantify for human assets than physical assets and so economies of scale for human assets are analysed differently. This, in turn, suggests that the manner in which company functions are integrated depends on the preponderance of either human or physical assets within that function. The next section of this thesis will investigate how the functions can be brought together in a prescribed governance format.

5.1.9 Unitary and multidivisional governance structures

Transaction cost analysis highlights the make-or-buy dichotomy in terms of the decision of whether to internalise an activity into a vertically integrated functional structure or to transact for it in the market. Chandler (1990) views this as a strategy since it is an allocation of resources necessary for carrying out long term goals. Once the strategy has been determined and the functions internalised, then a corporate governance structure needs to be imposed on those functions that have been brought within the company boundary. At the simplest level, Chandler (1977) observed that before the arrival of the railway in the US those firms that were involved in the transportation of goods tended to leave regulation of the business environment to government legislation. However, railway transportation necessitated careful coordination of traffic and this was heightened by the technological advances in the speed of the locomotives. It was therefore necessary to implement a form of management that was controlled from the centre.

The strategic purpose of the first railways engendered a hierarchical and simple form of structure, the unitary or U-Form structure. Generally, the simplest strategy is likely to be one pursued by firms that are small, or singular in their purpose, and so provide fertile ground for this kind of structure. This may begin with the most senior manager, often the owner, taking responsibility for all the major decisions which are then passed directly to those who will implement them. The centralised format of the U-Form provides a hierarchical structure for administering the functions of the organisation (Ferguson and Ferguson, 2000). It is designed to reduce opportunistic behaviour by individual employees through the establishment of collective bargaining that consigns workers to recognised groups, thereby removing the possibility of acting to their own advantage. Personal advancement is then offered in the form of promotion, with new entry being restricted to the most basic levels of job definition (Moschandreas, 1994). The basic structure of such a firm is shown in Figure 5.2

Figure 5.2 U-Form functional governance structure



Source: Moschandreas, 1994

In the U-Form structure the functions have functional managers who gather information which they present to the CEO and await instructions. The CEO is therefore responsible for the daily operations of the company as well as its strategic direction. This means that managers specialise according to their function and communication is conducted functionally, meaning that information passes up the hierarchy to the CEO but not across to other functions, except through the CEO. The system assumes that the CEO has enough experience of the functions to be able to make informed operational decisions, but it also implies that the functions will work together under the direction of the CEO. Moschandreas (1994) argues that in practice

the U-Form is vulnerable to "empire building" where functional managers attempt to cultivate as much influence with the CEO as possible in order to further the interests of their departments or even their own personal interests at the expense of profit maximisation.

The U-Form is considered applicable as long as the numbers of functions under the CEO are not too diverse and each function can discharge its responsibilities. However, should a company internalise a greater variety of functions then it becomes progressively more difficult to coordinate them as if they were facets of a single business. For example, a company might have two manufacturing functions, one producing pharmaceuticals and the other cosmetics. The marketing requirements for each might be so distinct that a single marketing function would not be suitable and a way would have to be found to divide its operations between the two manufacturing functions (Ricketts, 1987). In this way diversification brings with it complexity and the need to coordinate the different functions, meaning that the CEO has less time for strategic decisions. One solution is to add layers of bureaucracy but this can reduce the flexibility of the enterprise and encourage opportunism (Moschandreas, 1994). Hill (1985) also puts forward the concept of the H-Form, a holding company with centralised profit collection but decentralised strategic, financial and operational control. However, this does not seem to offer an organisational structure as such and might be better conceptualised as an investment vehicle.

Chandler (1977) observed that diversified, multiunit enterprises developed a middle management to monitor functional performance and coordinate material flows while the senior management evaluated information flows from the middle management and allocated strategic resources accordingly. This supplanted the role of the market between independent organisations such that:

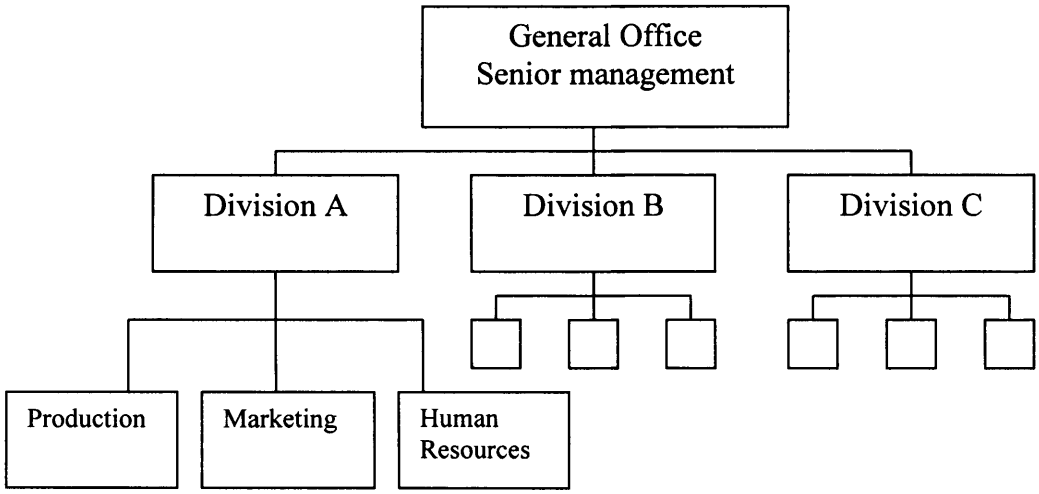
"...the visible hand of management carried on the functions hitherto performed by market mechanisms in American industry." (Chandler, 1977, p.377)

This form of structure was the multidivisional M-Form, a decomposition of the U-Form. At its most basic it comprises a general office to monitor the operating divisions and implement strategic allocation of resources. The M-Form is a

multidivisional organisational structure of bureaucracy that separates strategic and tactical planning, delegating operational control to internal divisions while a central headquarters retains strategic and overall financial control. This prevents divisional managers from diverting funds opportunistically to their own operations and frees senior managers from making detailed operational decisions for which they lack information (Freeland, 1996a; 1996b). As Klein (1988) and Hoskisson *et al.* (1993) also noted, ownership of labour contracts means that any errant staff can be more easily dealt with than through the mechanism of the market.

With the headquarters having intimate knowledge of the financial affairs of each division it can allocate and monitor capital more closely than could shareholders through the external capital market. This means that it is more efficient at allocating resources, although if economies of scope existed between the functions when they were in the U-Form structure then they will be lost in the M-Form. Furthermore, when administrative functions such as human resources and accounts are distributed amongst the divisions they may lose access to the economies of scale that existed when they were unified in the U-Form. The M-Form therefore has the advantages of being able to allocate resources, inhibit opportunism and encourage innovation within functions but it may also increase the costs of operating those functions. The M-Form of organisational structure is illustrated in Figure 5.3 below with examples of the functions that are included with the divisions.

Figure 5.3 M-Form multidivisional governance structure



Source: Moschandreas, 1994

The M-Form originally came to prominence as a system of bureaucracy used by Alfred P Sloan to control company divisions. Sloan had made his reputation with the Hyatt Roller Bearing company, purchasing it in 1899 for $5000 and selling it to William Durant in 1916 for $13.5m. The absorption into GM put Sloan in control of the disparate United Motors component supplier subsidiary, which he then reorganised into semi-autonomous business units. With the near financial collapse of GM in November 1920, GM's president, Pierre du Pont, invited Sloan to set about a similar strategy of reorganisation for GM as a whole (Chandler, 1990).

Sloan identified the main problem at GM as being lack of control, a classic transaction cost issue, with high levels of inventory and a confused product line at a time of economic recession (Sloan, 1986, p.42). This was tackled by drawing together the separate divisions under the command of a centralised administrative structure to ensure more effective co-ordination and control. Conversely, rival automotive company Ford had taken a highly integrative approach that was supported by a rigid system of controls throughout the company which precluded a unified central control. It also exhibited an overdependence on existing structures to the degree that it remained inflexible in the face of GM's rise (Kuhn, 1986). Henry Ford had originally shown great innovation in creating his company but in fashioning it in the image of production flows had failed to apply a strong corporate governance structure.

The form of loose vertical integration at GM was based on three principles (Sloan, 1986, p.50):

1. A degree of independence for each division so that it had a sense of its own responsibility and contribution.
2. Appropriate measure of return on investment for each division to reveal the level of its efficiency.
3. Centralised decision making on additional investments with regard to their utility to the group as a whole.

The second two items are concerned with financial controls while the first recognises the advantages of the human element, described by Williamson as being at the root of opportunism, but here it is presented as having the potential for a positive contribution. In other words, opportunism is seen as a positive attribute to be nurtured and so illustrates that the human element is a symmetrical risk with both negative and positive outcomes possible. Williamson (1975) puts forward three strategic control systems inherent to the M-Form:

1. Internal incentives and control to align personal interests with those of the firm.
2. Internal monitoring system reporting to senior management that is more comprehensive and prompt than an external audit for the benefit of shareholders.
3. Resource allocation based on objective evaluation of profitability

In practice, the division of responsibility in an M-Form corporation may not be as distinct as the theory sets out. Assuming that the personnel who are stationed within the headquarters have been promoted up the corporate hierarchy, rather being trained purely as strategists, then it might be expected that they would wish to exploit their experience of operational matters. As Moschandreas (1994) points out, senior managers may become involved in operational matters rather than restricting themselves purely to strategy. Furthermore, they may not be interested in profit maximisation for the benefit of shareholders but simply a satisfactory return. There is also the possibility of opportunism within an internal incentive system amongst

divisional managers who are eager to protect their own interests. Finally, the divisions themselves may become so big that they take on the same disadvantages as large U-Form firms, necessitating further divisionalisation.

In order to test the empirical evidence for the M-Form researchers have looked at how it may be applied in new and different situations. Chang and Choi (1988) took a transaction cost approach to analyse company structure with regard to the state of the market. This research focused on Korean companies operating in the poorly developed domestic market, one that can be assumed to contain more market imperfections than would those in more developed countries at that time. Korean business groups, known as *chaebols*, exhibit vertical integration and diversification, enabling them to pursue both economies of scale and economies of scope. Although business groups are not confined to Korea they have been remarkably conspicuous in that country, taking 40.7% of total manufacturing shipments by value six years before the study took place. Donaldson (2001) argues that the M-Form reduces uncertainty by internalising markets, and this can be observed in Korean business groups. However, this uncertainty is based upon the poor technical development of the resource market rather than uncertainty created by high rates of innovation. Korean firms can be seen to diversify in order to create a market rather than internalise one that already existed. Added to this is the fact, conceded by the authors, that the Korean groups at the time of the study enjoyed substantial external government support.

Hill (1988) suggests two types of diversification: related diversification and unrelated diversification. If the diversification is related, i.e. the divisions work with each other in the same industry, then the organisation is structured to both differentiate the functions so that they may specialise, while also internalise them to reduce transaction costs. Such a multidivisional form would need more operational control of the functions from the centre, an organisational structure Hill terms the CM-Form. Alternatively, if the diversification is unrelated then the purpose of the M-Form is to exploit the economic benefits of an internalised capital market. According to Teece (1981) control of capital in unrelated diversification is effective because the senior management is privy to financial information to an extent that external shareholders are not, and is able to monitor and act on investments more swiftly and cheaply:

"Furthermore the M-Form creates its own internal miniature capital market which replicates external capital market functions and economises on transactions cost." (Teece, 1981, p.175)

U-Form integrated firm also internalises the functions of the market, although it does not attempt to replicate the capital market to the same degree. The M-Form, by separating the divisions, creates an environment where the divisions must appeal for funds based on their investment potential. It might be argued that the same processes could be achieved within a U-Form structure, perhaps with the CEO personally gathering and evaluating the data of different functions rather than expecting proforma information to be passed up the command chain, but this is not a capability that is inherent to the formal definition of the U-Form structure. However, it does suggest that the distinction between the M-Form and U-Form is characterised by the formal reporting of data, rather than the separation of operational and strategic decision making.

Taking the operational perspective, other literary sources considered how production was operated within the two basic types of governance structure. Burton and Obel (1980) found that the M-Form was suitable for parallel processes, when they share the same resources, but the U-Form was suited for sequential processes that were working on different stages of one production system. Furthermore, relatively small companies were found to be better served by the U-Form alone whereas larger companies have a choice between the M-Form and the U-Form. For these larger firms the evidence suggested that the M-Form was preferable under all circumstances but most especially when diversified and undergoing high rates of growth. It is at times such as these that clarity needs to be brought to the reporting of data, but in a fast moving environment there is also the difficulty in separating operational and strategic decision making processes.

Donaldson (2001) draws a similar comparison between the M-Form and the U-Form structures. The research was conducted within contingency theory which seeks to align the appropriate organisational structure with the three factors of environment, company size and strategy. For example, the functional structure of the U-Form has

cost advantages in simplicity and specialisation, which then places a high priority on the pursuit of economies of scale. Alternatively, the M-form decentralises control of the functions and allows them to operate as semi-autonomous business units, a strategy which is particularly suited to highly diversified product ranges.

Focusing on the three factors, Donaldson (2001) defines environment as being the stability of the firm's situation, a vertically integrated hierarchical U-Form structure having the advantage when there is little technological change while a more flexible "organic" M-Form structure is better suited when the industry is in flux. This is in line with the findings of Burton and Obel (1980) that the M-Form was well suited to accommodating change. Considering the factor of size, Donaldson (2001) argues that employment of larger numbers of staff mean that tasks are more repetitive and therefore amenable to the setting of policies by a distant M-Form headquarters, while smaller staff numbers tend to be engaged in less routine tasks and senior management can be more personally involved using a U-Form approach. It might also be argued that routine tasks need less operational control, suggesting that some M-Form headquarters might have actually been U-Form but shorn of the need for regular operational involvement, thus leaving the management to focus on strategic issues.

Donaldson's last factor, strategy, concerns the range of products being made available, a diversified M-Form organisational structure being better suited to a diversified product range. Donaldson claims that contingency theory permits a wider range of corporate structures depending on the level of certainty and indeed, if Chandler is correct that structure follows strategy, then there should be as many structures as there are strategies. There may, though, be limits to the degree of change the M-Form can contain and some theorists have suggested that the business landscape has experienced a quantum change due to technological developments and globalisation of markets, leading to a new form of organisational structure beyond the M-Form. Doz and Prahalad (1991) argue that the M-Form of structure was inadequate for accommodating the wide disparity between countries, functions and approaches to business when the company is a diversified multinational corporation (DMNC). Although the M-Form relieves senior managers of making quotidian operational decisions they are still reliant on a flow of information in order to make judgements about resource allocation. Although the information should be of an objective type it

still requires a degree of interpretation and this can be difficult when the data is from an unfamiliar source, perhaps due to geographic or technical differences, possibly undermining the validity of the resource allocation decisions.

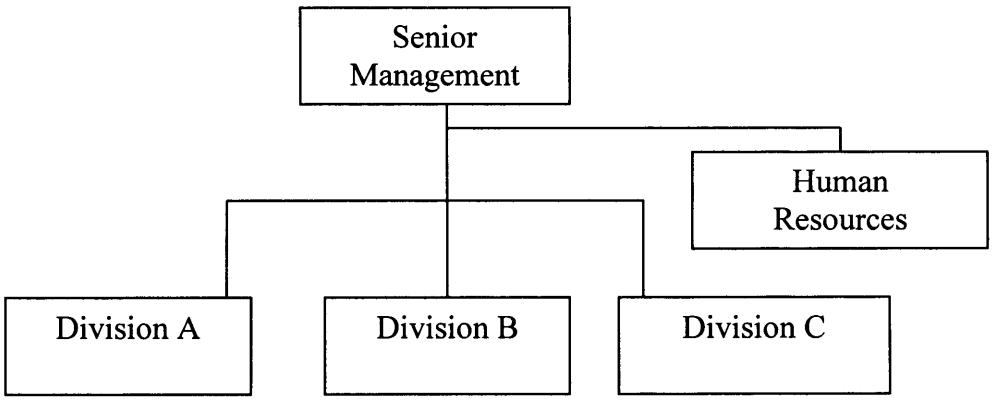
Bartlett and Ghoshal (1993) redefined the M-Form as a systematic devolution of assets and responsibility from corporate to divisional levels, suggesting that a new bottom-up approach would allow greater entrepreneurial and strategic control of the divisions. This recognises that an organisation is fundamentally a social structure and argues that a focus on functional structures obscures the roles of the human actors. As a consequence, the three levels of management (top, middle and front-line) no longer amend information from strategic to operational as it descends the corporate hierarchy, instead the front-line becomes the source of entrepreneurial activity, the middle coordinates the divisions and the top management creates the overall purpose while challenging the *status quo*. This has particular ramifications for globally spread companies where the lines of communication may be too long for effective strategic control from the centre to the dispersed divisions. As Freeland (1996a) points out, the sanctions and incentives by which the M-Form headquarters controls the divisions is dependent on the quality of the information passing between them. Bartlett and Ghoshal's "managerial theory of the firm" allows local divisions of DMNCs to exploit local resources and opportunities within the framework created by the top management. The economies of scope of the DMNC are thereby retained while economies of scale are effectively localised.

Hedlund (1994) criticises any structural form for being a crude categorisation of hierarchy that did not account for the detailed changes that take place within companies. This is particularly relevant when managing knowledge creation at different levels of aggregation, from the individual to the corporation as a whole. Where a hierarchical structure such as the M-Form would create institutional divisions between the knowledge holders, Hedlund suggests that an N-Form structure would be more appropriate. This is a heterarchical structure that allows each division to behave entrepreneurially (Ferguson and Ferguson, 2000). Hedlund defined the N-Form as an attempt to recompose the divisions of the M-Form to allow them to work together through lateral communication at middle management level and temporary groupings of joint personnel. Senior management then operates more like that in the

U-Form where it becomes involved in operation processes in order to promote cross-links between functions. The N-Form then allows the growth of knowledge in the corporation, Hedlund referring to it as economies of depth as experience is accumulated, but this can lead to the firm being introspective and therefore vulnerable to exogenous developments. Indeed, just as Chandler states that structure should follow strategy so Hedlund concedes that the choice between the M-Form and the N-Form depends on the nature of the firm's environment and that a compromise between the two structures may be more appropriate.

A compromise between organisational structures might be achieved by having two in place concurrently. For example, a hybrid of the M-Form and U-Form shows the M-Form decomposition of divisions in order to separate strategic and operational decision making. As before, this preserves the system of internal controls based on vertical flows of information in order to conduct efficient allocation of resources. Into this is introduced some of the functional character seen in the U-Form, such as marketing or human resources, which might, depending on the organisation, be better able to serve the company as a whole (Moschandreas, 1994). Such a hybrid structure is shown in Figure 5.4 below.

Figure 5.4 Hybrid U-Form and M-Form governance structures



Source: Moschandreas, 1994

If the divisions need to overcome some kind of separation problem, be it spatial or technical, then a matrix approach can be implemented. When disparate functions

would benefit from being coordinated with each other the matrix permits two lines of communication: vertically through the hierarchy, and horizontally between the functions. It is not an alternative form of corporate structure since it can exist within an M-Form, for example, but it does have implications for the degree of decentralisation and the role of managers (Ferguson and Ferguson, 2000). It does not have a preset format and Kolodny (1979) considered the matrix to be a flexible coordination device, the level at which it was applied in the enterprise depending upon the nature of the information processing demands. The most well known application of the matrix theory is the aircraft industry where the range of technical processes requires a multidivisional M-Form, but since the divisions are working towards unified projects targets, often in an exploratory or research environment, it is necessary to establish close communication between the divisions. In application the matrix system is often transitory, tending to be shaped according to the nature of the project, with the divisions reporting to both the divisional management and the project management as necessary. Costs occur, though, when simultaneous projects duplicate efforts being made elsewhere or the command structure becomes too complex.

It is feasible, then, that the matrix system could even be applied to a U-Form enterprise. This would then bring the functions into closer contact, particularly useful if the final product involves different production technologies. In essence, the choice of organisational structure then comes down to the U-Form or the M-Form, the M-Form being the one that seems to attract the most attention. Yet if the purpose of management is to control the activities of a company, then it could be argued that the U-Form simply describes the system of command, each level holding responsibility according to its position in the system. Thus for a large company, lower management would tend to have more operational control while higher management would tend to have more strategic control. Conversely, the purpose of the M-Form is to formalise the transfer and evaluation of data within a large or complex organisation. The fact that senior management then use the data to make strategic decisions is due to their elevation in the command system rather than the official definition of their role. Indeed, the need to keep strategy and operations in alignment suggests that senior management would have a close interest in operational matters, albeit through the proxy of lower managers.

The current automobile industry presents particular challenges to the M-Form structure since it is made up of technically distinct functions which are required to work closely on joint projects almost as complex as in the aircraft industry, yet they may also be geographically spread. The following section of this chapter will investigate how these considerations impact on the corporate governance of automobile manufacturers.

Part II: Constructing the Automobile Industry Paradigm

Part II will draw on the theoretical basis of paradigms discussed in Chapter 2 (see 2.2.3 above) and use it as a conceptual framework for the automobile industry. The resultant model provides an organisational structure of vertical integration and output size for the prototypical automobile company. Chapter 2 described the role of paradigms in science and the rest of this chapter will construct a paradigmatic view of firms in the automobile industry. Industries can be considered to be paradigmatic when they have developed within confines as much as scientific paradigms. The parameters are set by the organisational vertical integration and the production technology, this giving rise to the economies of scale determining the present limitations and future potential of the technology. Technical progress is then demonstrated by a process of puzzle solving, exploring the limits of the technology, which brings the manufacturers closer to the theoretical output optimums. Organisational structure will arise by a similar iterative process as companies converge on a commonly held degree of vertical integration.

Since car manufacturing is constrained by parameters of scale and integration it is proposed that this can be viewed as a paradigm. If this is the case then development of the industry has not been driven by progressive linear innovation for its own sake but by a process of internal problem solving. The paradigmatic view of the automobile industry demonstrates how companies must adhere to the strictures of the paradigm in terms of scale and vertical integration in order to operate at their optimal levels. This assumes that there is no quantum change in the underlying technology to cause a paradigm revolution, which in any case would have no effect on the internal characteristics of the current paradigm. The approach to be taken here will begin by defining the structuring influences on contemporary automobile firms.

5.2 Constructing the automobile industry paradigm

Economies of scale are most closely associated with physical assets since they are often based on capital investments designed for volume production. Human assets are constrained in their output and may rapidly exhibit diseconomies of scale, particularly when related to management factors due to the fixed nature of managerial capital (Levy, 1985). In either case, as has been seen in the previous chapter, there is a point of equilibrium where economies of scale are being exploited to the full. A firm can access these cost benefits by owning the physical assets of that process or buying from a company that does so. Lyons (1995) found that UK engineering firms tended to access economies of scale through the market mechanism, yet this would also imply additional costs of making transactions. It would only be to the firm's advantage, therefore, if the marginal benefit of accessing economies of scale through the market exceeded the marginal cost of transacting in the market. Furthermore, it might be presumed that transacting in this way will always provide some access to the supplier's economies of scale.

D'Aveni and Ravenscraft (1994) investigated the effect that vertical integration had on costs when economies of scale are available internally and found that additional economies were uncovered even after controlling for the effects of economies of scale. However, the authors also found that internalisation insulated the company from market pressures and so a slackening of incentives to minimise costs allowed inefficiencies to emerge. McAfee and McMillan (1995) concluded that much of this effect was due to the chance for opportunism as the company grew larger and that the hierarchical structure creates a distance between the management and the workers that have the knowledge. This results in a principal-agent stand-off:

"The holder of the information exploits the bargaining power the information gives him, earning rents; in anticipation of this, the principal manipulates the outcome." (McAfee and McMillan, 1995, p.406.)

The authors see these rents as a necessary evil, the internal "lubrication" to the mechanical friction of transactions. This, then, sets an upper size limit on the firm and

reverses the conventional view that an industry is competitive when the firms within it are relatively small, the authors arguing:

"Thus firms are small because the industry is competitive." (McAfee and McMillan, 1995, p.402.)

This suggests that integration is not a simple matter of internalising economies of scale enjoyed by an external party because in the process the advantage will be countered by rising costs elsewhere. The decision whether to 'make-or-buy' depending on the transaction costs is what limits the vertical boundaries of the firm, but implicit within this is the trade-off between economies of scale in production and diseconomies of scale in the hierarchy. This points to a standard firm size and organisation when three conditions are satisfied:

- The production technology underlying the quantification of economies of scale is accessible throughout the industry.
- The transaction cost considerations are common to all participating firms.
- All the human assets behave in largely the same rational manner within the same organisational structure.

The previous chapter has outlined how economies of scale influence firms within the automobile industry, providing a reference point towards which companies converge. The first part of this chapter has shown that it is the rational behaviour of the human assets that induces an additional cost, a transaction cost, which then forces the make-or-buy decision. This is driven by a vulnerability to specific assets which may have the potential for *ex post* advantages that accrue asymmetrically to the owner of the assets, offering them an opportunity to create a hold-up. Since no contract can account for all contingencies, if the costs of such opportunistic behaviour are relatively high then the firm will integrate the activity into its hierarchical structure. Since opportunism has a human source then integration is primarily concerned with obtaining control of human assets through labour contracts, although this may then result in a principle-agent conflict instead.

There is, though, the possibility that the human actors may not act as rationally as economic theory might suppose. Williamson (1973) conceded this point in listing the three human factors that influence transaction costs. Bounded rationality for the human limits of knowledge and opportunism for the limits of human morality, but then "atmosphere" acts as a sociological limit to acting upon information. While the human actors may become aware of information that points to an economically advantageous action, there may exist social mores that inhibit them from exploiting the advantage. As Williamson (1973, p.317) states:

"Individuals who value independence highly may favour markets over hierarchy, while others may favour internal organization because of associational satisfactions which they derive."

This creates a problem when proposing a model for an industry since it must accommodate those individuals who might wish to base their selection of organisational structure not on economic factors alone but also as an expression of their individuality. Yet for economies of atmosphere to be crucial in determining organisational structure they must be powerful enough to overcome economic factors, not just influence them. Whipp and Clark (1986, p.33) noted that US corporations exhibited a predilection towards productivity over innovation, but also conceded that this was "well suited to the American market". Williamson (1996) gave some indication of the extent of atmosphere by sub-dividing "self-interestedness" into self-serving opportunism and frailty of motive and reason. This frailty affects only quotidian operations:

"If they slip, it is a normal friction and often a matter of bemusement." (Williamson, 1996, p.49)

Such frailty is hardly of a magnitude that would seriously threaten the economic structuring of an organisation. This thesis views atmosphere as being of a comparable intensity, springing from personal preference. Should a participant in a business be swayed by such personal concerns over economic factors one might even wonder if this will inevitably inhibit the sustainability of the firm, given that the financial viability ultimately rests upon the management of economic costs rather than personal

preference. This might even suggest that economies of atmosphere are more relevant to corporate failure, particularly if they involve cases of management that is reluctant to wholly embrace the economic argument. In any case, since individual preferences are highly variable, in sum they may be inconclusive, at least in larger firms. This is not the case for the other major human factor, opportunism, which will only vary in degree but will always have the same directional vector (i.e. a temptation to exploit the business relationship for personal gain). In proposing a general model for an industry, therefore, it is valid to focus on the technical and organisational cost factors that are generally prevalent.

Assuming that firms in an industry are faced with the same technical and organisation costs then a common type of economic foundation should become apparent. Output is prescribed by the presence of economies of scale, while vertical integration is prescribed by the presence of transaction costs resulting in a full-function structure (see Figure 5.1 above). The next sub-section of this thesis will investigate how the two forces of transaction cost economics and economies of scale create a paradigmatic structure for firms in the automobile industry.

5.2.1 Paradigmatic view of the automobile industry

The paradigmatic approach can be applied to any of the major functions of automobile manufacturing depending on the distinct nature of the underlying technology. Nieuwenhuis and Wells (1997) termed one process in automobile production, that of body panel pressing, as the Budd Paradigm and believed that as the process that defined the final product and the economies of scale for the industry it therefore structured the industry (see Chapter 4). Later developments in powertrain, particularly in the field of electric vehicles, show that the Budd Paradigm is not one that rules over the production of vehicle propulsion systems so it cannot be considered to encompass the entire production process, only that connected to body fabrication and painting. However, the Budd Paradigm predominates since it is this that sets down the MES for the firm, other processes being multiplied to equalise with the production of car bodies. This implies a structure for an automobile company but it does not explicitly address the issue of vertical integration which as has been

suggested is driven by transaction cost analysis. Thus, the Budd Paradigm does not of itself imply a size and shape for a prototypical automobile firm.

When the different functions of automobile production are defined by a common form of technology then the fixed costs are effectively common throughout the industry. If markets for sourcing the factors of production are generally equal for all participant companies, as they would be for a capital intensive industry such as this, then the transaction costs in procuring those resources will also be common to all companies. This means that there is an optimal structure to the extent of vertical integration for the firm just as much as there is an optimal output for prescribed economies of scale. Considerations of scale and vertical integration therefore arrive at a fixed size and shape for a prototypical automobile manufacturer. Structural differences would only arise where there are differences in the fundamental technology, which then changes the capital costs, or else changes in the factor endowments. Since labour affects mainly final assembly it does not have an effect on the production technology in the body or powertrain fabrication processes. R&D is also more concerned with the knowledge contained within the human assets rather than labour costs *per se*. Labour costs therefore have the greatest influence on the internal structuring of the final assembly process.

Developments in technology have the potential to change the paradigm by affecting the economies of scale and the transaction costs. It has been suggested that new powertrain systems might change the industry but so far this has been confined to hybrid engines which use electric motors only in an auxiliary role. Were there to be a wholesale switch to electric forms of propulsion then, although it would not necessarily affect body production, it could change the manner of the integration with powertrain production. Car firms might find that there were cost advantages to be gained from divesting themselves of their new electric powertrain production units and instead sourcing production externally.

The Budd Paradigm, as applied to BIW production, would be unaffected by changes in powertrain production technology, though a new MEPS for powertrain would have an effect on the lowest common multiple when matching the scale of the different functions. For the automobile paradigm being described in this chapter, which

includes scale and the full-function model of organisation, outsourcing of any function would have an impact. Indeed, this would represent a move to a new automobile paradigm, the paradigm revolution described by Kuhn. Essentially competitive paradigms can remain side by side since both provide acceptable solutions to their practitioners in respect to the problems they define. As the new paradigm proves itself more adept at solving a wider range of problems it gathers greater support. Kuhn claims of those that adhere to the superseded paradigm, they:

"...are simply read out of the profession, which thereafter ignores their work" (Kuhn, 1970, p.19).

For automobile production, in the early twentieth century the current paradigm superseded the craft production paradigm where coachbuilt wooden bodies were attached to separate steel chassis. It is not that craft production has disappeared altogether, for low volume production or individual customisation it is still an option, but it has been bypassed as an effective means of manufacturing standardised mass market vehicles on a large scale. Indeed, puzzle solving can carry on in the preceding paradigm, even if not with quite the same intensity as in the new paradigm. As Kuhn states:

"Mopping-up operations are what engage most scientists throughout their careers." (Kuhn, 1970, p.24).

A paradigm is successful while the adherents continue the "puzzle solving" activities. This is the fruitful part of a paradigm and the existence of, as yet, unexplained phenomena are viewed, not as weaknesses, but simply anomalies awaiting further research. The conditions for a revolutionary change to a new paradigm are set when the adherents of the existing paradigm find that it no longer adequately matches nature and so lose faith in it (Chalmers, 1983). For industry, these problems arrive in the form of exogenous shocks but not even dramatic rises in oil prices have done anything other than shift market preferences for cars. Not only did the oil price increases have no impact on the fundamentals of the narrowly focused Budd Paradigm, but also no impact on the automobile paradigm put forward in this chapter because the powertrain function is essentially unchanged. In the meantime, these

exogenous shocks have served to further motivate internal problem solving. It was one such exogenous shock that motivated Honda to design the CVCC lean-burn engine in order to meet emission regulations in the US (Demizu, 2003), and this represented the development of existing technology rather than a technical revolution.

Since paradigms are viewed as sociological constructs their characteristics can only be indicated, not proven. Moreover, those within the paradigm may be unwilling to recognize its existence when it might suggest their research is thereby constrained. However, paradigms aid comprehension of areas of activity since a conceptual framework can be applied, along with the methodological and predictive powers of the paradigm. Applied to an industry, this would prescribe a future structure that could be superseded only by a paradigm revolution based on a change in the fundamental technology.

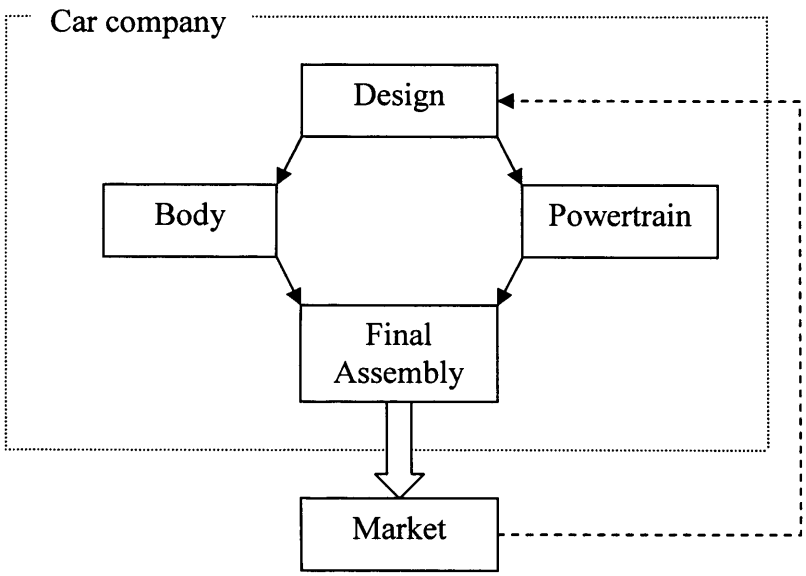
Such a paradigmatic perspective on the automobile industry is only valid if the underlying technology allows it. It can then be demonstrated how this is organised according to an established approach to arrive at a prescribed structure for a paradigmatic automobile company. This implies that any car company operating with the same fundamental technology would be governed by the same paradigm and so would be drawn to the same ultimate structure. Any company within the paradigm that did not achieve the prescribed scale and structure would be deemed to be operating at a sub-optimal level (i.e. operating at above minimum cost).

5.2.2 Vertical integration of the automobile paradigm

When a company takes more responsibility for production processes by internalising the supply chain it is said to be increasingly vertically integrated. A vertically integrated car manufacturer is one that has internalised all the major functions of automobile production. Car manufacturers have often explored the limits of vertical integration, for example, Henry Ford built a steel mill for his new factory at River Rouge (Rae, 1984). However, the purpose of this thesis is not to include every last detail of automobile manufacturing but to investigate the main structuring areas. The perspective taken of car firms in their generic form is therefore in accordance with the full-function model previously put forward (see section 5.2).

The company boundary of a typical full-function automobile company with its four modules of production is shown in Figure 5.5 below. This is a functional schematic of the vertical integration of the firm; it does not imply actual plants or their geographic positioning. The Design function instructs the Powertrain and Body functions, the output from these feeding into the Final Assembly function. The final products are released to the market, which is external to the functional operations of the company, and information from it is fed back to the company's Design function by way of a marketing capability which is part of the R&D activity.

Figure 5.5 Typical full-function automobile producer



In theory, any of the major functions can be external, including Design and Final Assembly. However, from an historical perspective, the default position for a car company before it vertically integrates has been to commence with design and final assembly functions. In this way the vehicles are conceived and put together by the new firm, sourcing all components externally. Rare examples of production existing before the R&D capability include Tata of India, which had its Indica small car designed by IDEA in Italy, although Tata had control over the parameters of the design process (SID, 2006). However, as will be demonstrated, most mass market firms start with the Design and Final Assembly functions at least, and then integrate Powertrain and Body as the business develops.

Since such an integrated structure takes time to develop and become established it is necessary to research archive data. The fundamental technicalities of automobile production were first introduced at the beginning of the twentieth century with the first experiments with flow production systems and the rise of mass production. This vastly improved assembly methods and brought efficiency benefits to the existing forging and casting techniques used for heavy components like powertrain. Finally, body production was revolutionised by the Budd system of manufacturing load bearing welded steel bodies that brought clear constraints to the style of vehicles that could be produced and indicated what the economies of scale might be. Once the technicalities of production were defined it was possible for a stable organisational structure to emerge. The process by which vertical integration occurs is not a static one and it is as possible for firms to divest themselves of their functions as it was to integrate them in the first place. By this reasoning, if functions remain internalised then, rationally, the transaction costs must continue to be minimised. The purpose of this section of the thesis is to build a representation of the core functions of automobile production as they have become established over time, whilst also noting how they might have been adjusted in detail to take account of the contemporary conditions.

5.2.3 Defining the functions

As a multi-stage process, automobile production involves inputs from a myriad of component suppliers. Wells and Rawlinson (1994) concede that there are difficulties in identifying the limits of the supply industry, the numbers of firms or even whether they can be considered automotive or not. However, for the purposes of this thesis, it is important to define how these firms relate to the automobile assemblers so that their role outside the vertically integrated full-function structure can be delineated.

Even for a full-function firm operating in the four core areas there will be component suppliers contributing at the sub-functionary level. These range from producers of small individual parts to larger sub-assemblies that are built up from a collection of components before the completed unit is fed into the main assembly line. The illustration of a full-function automobile company (Figure 5.2) has omitted the substantial role played by this supply industry. Firms in the supply industry can be

categorised into three types according to the nature of their output and its use (Odaka *et al.*, 1988):

1. OE (original equipment) for installation on new products.
2. RP (replacement parts) or SP (spare parts) to replace worn out parts.
3. Reconditioned parts, as low cost substitutes for RPs and SPs.

Since OEs are made to the design or requirements of the vehicle assembler, unlike the other two categories, only supplies of OEs are of direct interest here. A noticeable feature of this ancillary industry is its tiered structure of primary and secondary suppliers, the primary or Tier 1 suppliers often being sub-assemblers using parts manufactured by the secondary or Tier 2 suppliers, although some secondary parts may be procured directly by the vehicle assembler. There is a tendency in Japan for suppliers to be tied exclusively to one producer, as exemplified by the *keiretsu* structure. This may also include a degree of supplier selection within an obligation model of the supplier-buyer relationship wherein a preferred supplier is groomed for a high profile role. The supplier retains semi-autonomous control over production while the buyer can influence product specification, R&D and investment decisions (Morris and Imrie, 1992). This is analogous to the M-Form of internalised organisational structure in that the supplier has operational control while the buyer sets the overall strategy and capital investment commitments.

In Europe the relationship tends to be more polarised, suppliers being either majority owned or independent of the car producer (Wells and Rawlinson, 1994). When the supplier is independent this can lead to an adversarial relationship with cost reduction as the battleground. This operates through a tendering system that promotes a divided supply industry that is unable to make long term commitments to R&D or economies of scale in production. Smitka (1991) notes that Chrysler operated a policy of short-term contracts with suppliers that kept costs down through intense competition, but inhibited long-term investment in the supply industry and so stifled development. Despite this, Carr (1993) found little correlation between UK supplier profitability and production volume, instead sourcing the decline in the supply industry to the 40% rise in the currency exchange rate in 1979 which forced domestic suppliers to hold prices for four years in order to resist foreign competition. This left little for

reinvestment, although the study found that GKN was able to maintain world leading R&D expenditure up to 1983. This suggests that the connection between price tendering and low investment is not a direct one. Moreover, a competitive market is not described by the price mechanism alone but also that of product features so it is unlikely that price tendering represented one-dimensional contracts but was more likely to be one aspect of multidimensional contracts. It would seem therefore, that the problem with the adversarial relationship is that during periods of change (such as exogenous economic shocks) low switching costs mean that there is no reason for the buyer to support the supplier, thereby ending the relationship. It is notable that part of Nissan's recovery has been predicated upon an imposed 20% reduction in purchasing costs spread over three years and a 50% reduction in the number of suppliers (Donnelly et al., 2005).

The varying levels of integration between suppliers and car producers is illuminated by the range of relevant factors stated by Odaka *et al.* (1988). This includes technological distinctiveness of the part, production technology, demand and economies of scale. The core functions of the full-function car producer are technologically separate but closely tied in terms of the production system. For instance, the body panels are used solely by that assembler. This is not necessarily the case with other components, which may use an unrelated technology and may be shared with other car producers. Rhys (1972) reported that Lucas had a virtual monopoly in the UK for lamps, windscreen motors, dynamos and ignition coils. Toyota also recognised that some components were of a generic technology that could be purchased from a variety of manufacturers, while other components were of a specialised nature and therefore required Toyota specification and "teaching", secured by a close capital or financial relationship. The procurement category of Special Factory Purchasing requires 'distinctively special facilities', leading to possible financial ties in the future (Lamming, 1993, p.24).

The main consideration in this relationship between supplier and vehicle assembler is governed by transaction cost analysis. For generic components the car company has purchasing power and can switch suppliers for a variety of reasons, be they cost, delivery, quality and so on. As Odaka *et al.* (1988) have pointed out, the supplier is operating at a different technical, productive and scale level to the car producer. For

this reason, a fuel system supplier is sub-functional to the powertrain production which a gearbox or engine supplier is not. For each function it has been seen that there is a critical MEPS and the relationship with the supplier is functionary when the supplier is responsible for this scale of output. This is a proxy for asset specificity since although physical assets may not be specialised their workload is to the degree that without the contract to supply they would be redundant. Monteverde and Teece (1982) also discuss the crucial role played by the human assets where the supplier is engaged in research in support of the car manufacturers own R&D, arguing, like Klein (1988), that this will lead to vertical integration. As will be seen in the following subsections, when suppliers occupy a complete function such as powertrain production then they tend to become internalised into the automobile manufacturers structure.

5.2.4 Integration with powertrain

External supply of powertrains was common in the early years of the automobile industry. Thoms and Donnelly (1985) focussed on the cradle of the British automotive industry, Coventry. White and Poppe was the main engine supplier in the city and in 1906 the company was supplying 15 car manufacturers. In 1913 engine output reached 2,000 units but it progressively lost business to car companies seeking to vertically integrate powertrain production. Daimler, for example, produced its own engines and in 1908 planned for additional output of 1,000 engines, of which 400 to 600 were destined for Rover. White and Poppe was forced to invest in specialised capital as technology progressed but this created an asset specificity problem with Singer extracting credit terms from the company in 1912. The directors at Standard were aware of the power they had over White and Poppe, agreeing that if:

"...conditions warrant it, deliveries can be suspended at any time according to requirements." (Thoms and Donnelly, 1985, p.88)

Engine maker Hotchkiss and Cie was closely involved in supplying Morris and in the two years after being vertically integrated into Morris output quadrupled (Thoms and Donnelly, 1985). In the US, since a sufficient supply base had yet to emerge in the new industry, Henry Ford founded the Ford Manufacturing Company in 1905 to

ensure reliable supply of engines to required specifications and prices, then consolidated with the Ford Motor Company a short time later in 1907 (Hounshell, 1984, p.220).

Since most of the vertical integration with powertrain suppliers occurred in the early years of the industry there are few instances of it occurring in the modern era, even if that is taken back to 1945. This research is not aware of any significant automobile firms divesting themselves of their powertrain functions. Later entrants, such as Honda, began as an engine manufacturer in 1946 and then branched out into motorcycles in 1949 and then cars in 1967 (Honda, 2006). In Korea, Kia began engine production in 1973, a year before it began production of its first car (Kia, 2007). The Chinese manufacturer Chery was established in 1997 and began engine R&D at the same time, designing the ACTECO engine family in partnership with engineering consultants AVL of Austria; annual engine production capacity is 400,000 (Chery, 2007).

External engine suppliers operate now on a contractual basis with limited output, VM Motori of Italy supplying diesel engines to three major groups (DaimlerChrysler, LDV and BMC) with licensed manufacturing granted to Hyundai in Korea (VM Motori, 2006). It is quite common, however, for powertrains to be supplied from one division to another within a single group, such as VW's W12 engine (in its basic form) to Bentley Motors.

5.2.5 Integrating body production – the case of GM and Fisher Body

Body production is an interesting example of integration because the coachbuilding industry preceded the emergence of the automobile industry and so the early automobile manufacturers were able to source bodies externally from an established market. Subsequent innovations in body production that led to the load bearing steel body created a revolutionary upheaval in the industry which was addressed by internalising the body production function into the automobile manufacturers. In the case of GM and its body supplier, Fisher Body, this has become a celebrated example of internalisation and resulted in the application of the M-Form of organisational structure. It also brings a critical perspective to concepts of economies of atmosphere

and geographic proximity of manufacturing facilities. Subsequently, most automobile manufacturers have retained this function internally, although there has been some limited growth in contract manufacturing of steel bodies.

In the craft era of automobile production the vehicle bodies were commonly manufactured by large numbers of external suppliers able to produce in small volumes to customers' specific requirements. Automobile firms were, in the main, assemblers of outsourced components, the ultimate shape and purpose of the final vehicle being defined by the coachbuilder. Even when the automobile firms reached mass production levels of output the separate body could be manufactured externally in a plethora of different body styles, albeit to automobile firm specifications rather than that of the coachbuilder.

The emergence of the Budd Paradigm changed that because the system resulted in continuous high volume production of standardised bodies which defined both the shape and purpose of the vehicle. According to transaction cost theory, the high asset specificity and high uncertainty during the changeover to the Budd system would have culminated in vertical integration (David and Han, 2004). Accordingly, the absorption of Fisher Body by GM from 1919 to 1926 was one of the most notable cases of vertical integration in automobile industry and an example of Chandler's view that structure followed strategy. Although this took place during the early years of GM's formation into an M-Form style organisation, the essentials of the Budd system were being put in place and they have not fundamentally changed since that time. The steel panels were stamped out and welded in a manner that cannot change due to the nature of the material, although there has been some refinement of the process. For this reason the fundamentals of the story still shed light on the industry today, Freeland (2000) describing the case as "paradigmatic" and Klein (2000, p.107) states that:

"...we can learn a great deal about the economics of contractual arrangements by studying the conditions under which the Fisher-GM contract failed."

The situation in 1919 was that the vast majority of automobile bodies made for GM were of the open type, only 10% were closed body styles, yet by 1927 the proportion

of the latter type had risen to 85% (Sloan, 1986, p.152) due to the enabling technology of the Budd Paradigm. This was pioneered by the Essex division which reduced closed body prices such that between 1924 and 1926 prices of the "Essex coach" converged with, and then undercut, the open version (Georgano, 2000; Sloan, 1986, p.159). As Sloan points out, with Ford pursuing a static policy of minimal product development with the open body Model T the demand in the market for the new closed automobile was taken up by competitor automobile producers, Chevrolet's share of this new market rising from 40% in 1924 to 73% in 1926.

Fisher Body was a dominant force within the coachbuilding industry and GM was vulnerable to its supply. GM had tried to secure the relationship with the contractual approach, taking the precaution of obtaining a 60% holding in Fisher Body. This was enough to preclude the Fisher brothers, as owners of the voting stock, from merging the company with other manufacturers, particularly Willys-Overland in Cleveland. However, it did not give GM operational or strategic control of Fisher Body and supply of bodies to other vehicle manufacturers continued (Freeland, 2000). GM had also entered into a ten year contractual agreement sourcing bodies from Fisher Body for a payment of cost plus 17.6%. According to Klein (2000) this removed from Fisher Body the motivation to reduce transport costs, since any additional costs were covered by the contract, and indeed attracted increased profits. This was particularly relevant to GM's plant at Flint which was some 57 miles distant from Fisher Body's Detroit plant. However, the Fisher brothers were reluctant to invest in a plant in close proximity to Flint and this constituted an apparent hold-up. Yet Klein (1988) argued that specific physical assets do not have to be owned by the supplier, the buyer can purchase them and employ the supplier to use them. Coase (2000, p.29) takes a similar line, pointing to the funding by GM of a previous Fisher Body facility in order to supply a Chevrolet assembly plant:

"It is not without interest that it was Fred Fisher who suggested that the body plants be built on Chevrolet property."

Freeland (2000) found that the Fisher brothers were reluctant to set up a new site at Flint, not because they were averse to making the investment but because it would have made production at their Detroit plant less economically viable. It was much the

largest Fisher Body plant, twice as big as the next in size, and enjoyed considerable economies of scale as it supplied important customers in the immediate locality. Even if GM had made the investment in a Fisher Body plant at Flint, it would have forced the Fisher brothers to restructure the Detroit plant to reduce its capacity and render production there less economic.

This positioning of the plant also demonstrates that geography was already a significant factor in the industry. Indeed, with the technical principles of the industry established, proximity of certain facilities would be a constant throughout the future development of the industry. Although the absolute costs of transport have changed over the period since the Fisher Body episode, as a cost relative to production costs and competitor costs it is as relevant now as it was then. GM's plant was much further from Detroit than its rivals and with the rising popularity of the closed steel body transport costs would have come to dominate total body production costs. This might have been alleviated if bodies were generic automotive components since GM would not have been dependent on the distant plant. Unfortunately for GM, load bearing bodies are the least generic because they define the vehicle type. Although other body suppliers were available there would still have been switching costs due to the specialised nature of the bodies. It was also not yet clear how far the market would shift towards closed steel bodies and, with the future of GM in the automobile market at stake, it was vital for GM to be able to control its supply. As Walker and Weber (1987, p.590) state:

"...as uncertainty rises regarding a buyer's future requirements and, correspondingly, regarding potential adjustment costs for suppliers, contracts become very difficult to write. Producing a component in-house consequently becomes more attractive."

If Fisher Body's output had been wholly dependent upon GM then GM would not have been in conflict with its supplier. Only by being in a symbiotic relationship would a relatively costless, self-regulating relationship have been possible instead of vertical integration. As it was, vertical integration was the short-term solution to the external problems of body supply within the new Budd Paradigm. According to Klein, Fisher Body had found itself in a position where it could hold up GM, forcing GM to

purchase the remaining 40% of the supplier at a premium of over 50% to the market value (Klein, 2000, p.124).

Klein speculates that the two companies had always been aware that their contract was "incomplete" but were able to rely on the self-enforcement mechanism of their reputational capital. This was changed by the unforeseen popularity of the closed body which presented a critical opportunity for GM to overtake Ford, yet this new development also gave unprecedented leverage to Fisher Body over GM. The original contract had been formulated to prevent GM holding up Fisher Body but now GM's only escape before the expiration of the contract in 1929 would have been by voluntary bankruptcy. The stability afforded by the 1919 arrangement was inflicting "rigidity costs" that could only subsequently be avoided by vertical integration (Klein, 2000, p.130).

Lieberman (1991) found empirical support for demand variability or uncertainty being a determinant of vertical integration, although David and Han (2004) found less convincing evidence. In a stable industry GM and Fisher Body might have sustained a long standing relationship. Coase (2000) denies that a hold-up occurred because he cannot conceive of a circumstance when it would have been in the Fisher's interest to cause one. The brothers were, in any case, employed by GM by this stage and so it would have been injurious to their own careers to have acted for Fisher Body against GM. However, a hold-up does not have to culminate in a complete cessation of supply; it might involve resistance to fully comply with the wishes of the buyer. This would certainly fit the predicament GM found itself in where rivals in Detroit were being favoured by the close proximity of the local Fisher Body plant.

A possible alternative for GM might have been to renegotiate the contract, but this would have perpetuated the problem of rigidity in an industry that, for GM and its annual model change policy, required flexible responses until the scale demands of the new technology had been settled. While economies of scale in body production remained an externality to GM it would have had no control over it. Although Lieberman (1991) found that the quantities of product flowing between the contracting parties had no significant impact on the tendency to integrate this did not recognise the critical role played by economies of scale. Once the quantities involved

in the deal are within striking distance of achieving significant economies of scale then they become internal to the relationship and it is in the interests of the buyer to have some control. Coles and Hesterly (1998, p.327) were of the opinion that economies of scale were crucial to vertical integration when the firm could achieve these economies internally just as much as a supplier could. Fisher Body was in a position where it could enjoy economies of scale in the new production system by supplying a diverse number of car assemblers. Yet this describes a typical supplier-buyer relationship, GM only needing to internalise Fisher Body if it could better exploit the economies of scale. Since forcing Fisher Body to invest in the Flint plant would have, in the short term at least, reduced the access to economies of scale there was no reason on these grounds to vertically integrate.

As owner of Fisher Body, GM could gain control of the new technology and avoid the costs of renegotiating contracts at frequent intervals. Although Williamson (1975) chooses not to emphasise it, frequency is one of the three dimensions of the transaction cost approach. Klein agrees, concluding that the affair with Fisher Body was not concentrated on asset specificity alone, but if there is a need for flexibility when asset specificity is high and reputational capital is low then internalisation protects the manufacturer. However, Coase (2000) was of the opinion that the Fisher brothers would not have wished to risk their reputation because they were supplying bodies widely throughout the industry.

There is some possibility that Williamson's concept of atmosphere might have some relevance here. Freeland (2000, p.42) notes a reluctance on the part of the Fisher brothers to relinquish control of their family firm:

"Accustomed to the autonomy of running their own firm, the Fishers made it clear that they did not wish to sell their business to another company and to stay on as employees."

It would be tempting to categorise this as personal preference, and therefore attributable to atmosphere, but the brothers had started the company as an innovative manufacturer of automobile bodies, without reference to the preceding generation of carriage makers, and by 1916 the company was the largest body manufacturer in the

industry. The Fisher brothers had also started the Hinckley Motor Company around 1914 to manufacture engines, initially for trucks bound for the European war (Coase, 2000). In 1919 the Fisher brothers were formulating a plan to enter the automobile production business themselves, exploring a $10m joint venture with Willys-Overland. Far from being held together by atmosphere, the siblings appeared motivated by a desire to exploit the economies of scope in their managerial and entrepreneurial skills, culminating in an automotive group to rival GM. Since GM lacked the knowledge the brothers had in body production it was vital to secure their services during a period of uncertainty: it cost GM $27.6m for the first 60% holding and another $136m in stock for the remaining 40% (Freeland, 2000). Clearly, the brothers were not defending their family firm for reasons of atmosphere but because they believed they had a successful business model, and one with a quantifiable price.

The conclusion of the Fisher Body episode was part of the implementation of the M-Form organisational structure at GM. The senior management at GM had needed strategic control over Fisher Body and this then became a constituent part of GM's M-Form of structure. The critical component was not the cost of the physical assets at Fisher Body but the costs of the uncertainty derived from the variability in the market. Internalising Fisher Body allowed GM to make labour contracts directly with the management, initially comprising the Fisher brothers themselves, thereby permitting greater flexibility at a time when the new production technology had yet to settle (Klein, 1988). Indeed, the day after Fisher Body was acquired by GM, a $5m investment in a body production facility at Flint was announced while the Detroit Fisher Body plant was subsequently closed. The strategy set the tone for the industry as a whole and GM's vertical integration introduced an industry wide trend (Klein, 2000).

5.2.6 Integration with design

The ability to research and design future products lies at the very heart of any corporation. R&D is the source of all product innovation and so its vertical integration within the firm allows it to come into contact with all parts of the firm (Armour and Teece, 1980). It might be argued that these contacts could be contracted for, but innovation is opportunism at its most unpredictable and fertile. Furthermore,

integrating it with existing production facilities provides a focus for the R&D activity. Coles and Hersterly (1998) considered the possibility that research can make unexpected leaps forward, rendering existing technology obsolete. Should the research be conducted by an external organisation then it creates an asset specificity problem:

"New development in technology could render the methods used by the contractor obsolete before the terms of the contract expire. The contractor, however, may be unwilling to incur the additional costs of the new technology before the existing contract expires." (Coles and Hesterly, 1998, p.326.)

The Design aspect of the full-function model is the one least likely to be external in the first place, therefore least likely to be a target of subsequent vertical integration. This is because the Design function is the origin of the ultimate product, the other functions serving to bring the product into being. For this reason, automobile companies that operate without their own design capability tend to owe their existence to national and political strategies rather than entrepreneurial innovation. Many developing nations have attempted to industrialise by inviting foreign firms to enter their markets using the mechanism of joint ventures with local firms in final assembly. The local automobile firm may be wholly owned and a standalone assembly facility, but it is dependent on the foreign firm for the product designs.

Countries where this has been commonly practised include Iran, India and China. Iran Khodro, the national automotive champion, started out manufacturing British Hillman Hunters as the Paykan from 1967 under licence from the Rootes Group, continuing under Chrysler and then Peugeot from 1978. Iran Khodro's attempts at developing the Paykan were not far reaching, although it did manage to fit the Peugeot 405 body onto the Paykan platform to create the 405 RD (rear-wheel-drive) for reasons not specified (Iran Khodro, 2005). India went in a similar direction, manufacturing the 1948 Morris Oxford as the Hindustan Ambassador virtually unchanged until the present day. Ironically, the few that are now imported into the UK have to undergo extensive modifications to meet current legislation.

China has used car assembly as a device for technology transfer. Foreign firms are limited to maximum shares in joint ventures of 50%, the only foreign majority-owned plant being a Honda factory manufacturing for export. In partnership with foreign firms the largest Chinese firms have achieved high levels of output, 911,748 units in the case of SAIC in 2005, but it has only been recently that indigenously designed and produced cars have made a significant impact on the market. Even so, they have yet to reach globally recognised standards, local firm Chery having to postpone entry into the US market by two years until 2009 due to difficulties in overcoming design challenges (Automotive News, 2006c). The company is also dependent on numerous external consultancies, such as Lotus of the UK and AVL of Austria. This demonstrates that lack of geographic proximity is no impediment to the supply of R&D, although companies usually operate R&D branches in target countries.

There may be some notion that the economics of atmosphere has a role to play in the promotion of R&D capability by national governments. This can include the elevation of car firms to the status of national champions in order that they might be catalysts for wider industrialisation. The implication of the political involvement in structuring the industry in China and Iran is that car companies that do not have control of product design are in a potentially unstable condition should that support fall away. The underlying instability, though, and hence the fundamental structuring factors in these cases, are based on the economic concepts that deal with the treatment of assets. R&D is defined by human asset specificity and advantages resulting from innovation will accrue to the company that owns the labour contracts of the engineers. R&D suppliers therefore work on a contract by contract basis in order to control the succession of innovations. This increases transaction costs for the producers so governments compensate for this by providing long-term support.

The efforts made by governments to promote R&D within domestic companies may be an effective policy. Zenger (1994) noted that engineers not only bring knowledge with them to their jobs but they also accumulate knowledge through work experience which makes them attractive to new employers. In this way the knowledge can become disseminated throughout the industry. This thesis has also found that R&D teams do not need to be excessively large. It is difficult for any company to monitor and provide incentives for knowledge but it costs less to do this in small teams

because managers are in closer contact with the engineers, they may even be among their number, so have a better understanding of performance. It could also be suggested that since achievement is more readily identified in small teams it is easier for engineers to gain recognition and status. Zenger states:

"Small firms will attract individuals with superior talent and ideas, and will motivate higher effort than large firms" (p.713).

Thus, smaller R&D departments will recruit better engineers and then compound the advantage by having them work more efficiently, though this may mean the firm losing some access to economies of scope. Large firms, as noted previously, can replicate the small firm advantage by fragmenting into small teams, buying up small companies or hiring small teams as outside consultants, while continuing to access economies of scope. This presupposes that contracts can be written by large companies for those engineers that are indistinguishable from the contracts that small companies could write, yet such a condition must be entirely theoretical since, if the two contracts are inseparable, then the firms must, *de facto*, be the same. If a firm is defined by its contractual relationships, as put forward by the theory of transaction cost analysis, then only a small firm can write a small firm employment contract.

Chapter 4 demonstrated that economies of scale for all the functions in automobile production are high, but not necessarily inaccessible. The output of the functions can be brought within reasonable synchronisation of each other, and this chapter has demonstrated how the functions can be internalised. The next subsection will detail the model of an automobile company according to the considerations of scale and structure.

5.3 Resultant size and shape

Having established the organisational structure of the full-function model through the study of transaction costs it is now possible to quantify the dimensions from the earlier investigation of the economies of scale for each function, or productive unit (Whipp and Clark, 1986). This then results in the proposed prototypical full-function automobile company model which is at the basis of the automobile industry paradigm. Figure 5.6 shows the four functions with the MEPS for each as in the case of the prototypical automobile company outlined in Chapter 4 (see section 4.5 above). Continuing from Figure 5.1, the design function is termed R&D and comprises 1200 personnel working on 5 model programmes based on 3 platforms with intended output of 600,000 units a year. Body production is now expressed as body-in-white (BIW), in deference to the Budd Paradigm, with MEPS of 500,000 units a year. The Powertrain function is shown with a MEPS of 1m units a year while the Final Assembly function has been allotted a MEPS of 350,000 units a year.

Figure 5.6 Full-function model quantified

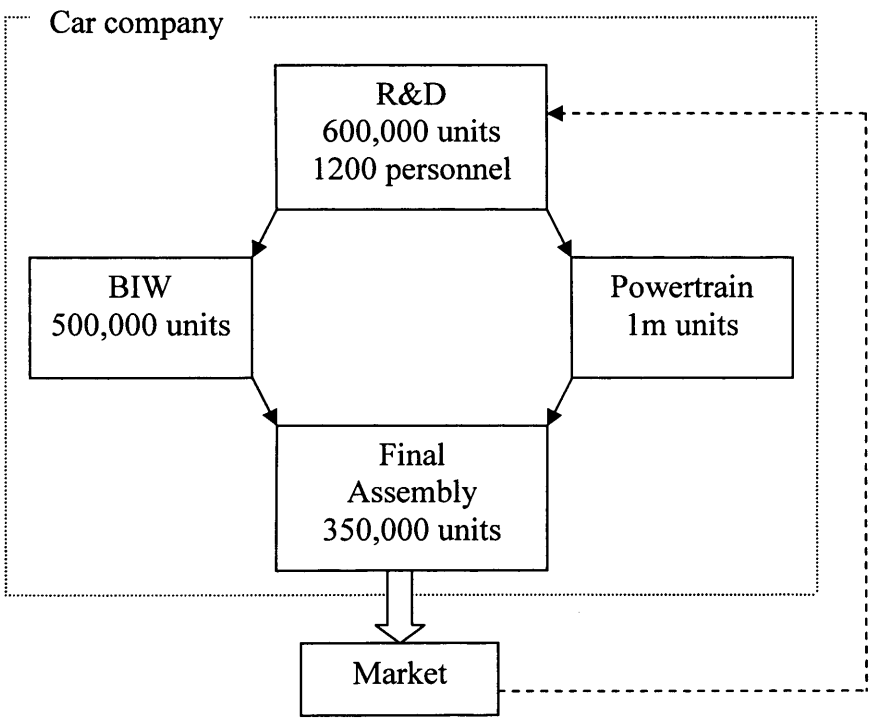
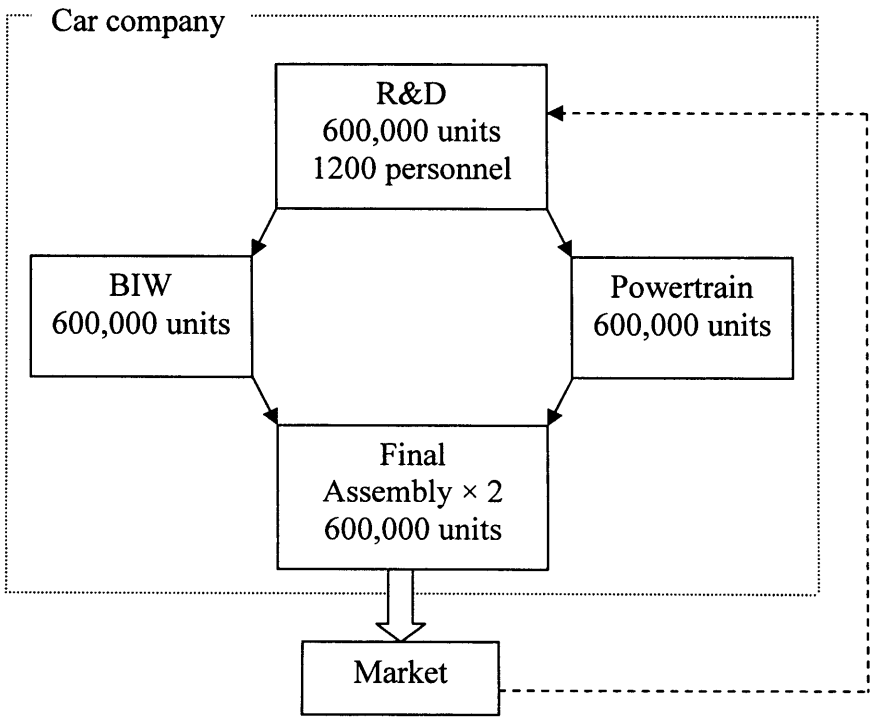


Figure 5.6 shows that there would be a great deal of mismatch in output capacity between the various functions if the firm were constructed in this way. The capacity

limit in Final Assembly creates a constriction in the production flow that forces the preceding functions to operate well below the scale shown. However, as the LAC curves for each function depicted in Figure 4.19 above show, there is a range of plant sizes which may not be operating at the optimum but they are within the relatively flat region of the LAC curve. Taking the MEPS of one process as the anchor point the other processes can be adjusted accordingly. If this were BIW, for example, R&D would be reduced slightly in size (perhaps 1000 personnel working on 2 platforms and 4 models), Powertrain would be half the size (500,000 units a year) while Final Assembly would be reduced to a capacity of 250,000 units a year but with two plants. As subsections 4.3.2 to 4.3.5.1 above show, there are examples of these plant sizes within the industry.

This thesis takes the view, however, that R&D MEPS is the anchor point for the full-function automobile manufacturer because beyond that point it is inflicted with diseconomies of scale. For the prototypical automobile company, MES_P is considered to occur at around 600,000 units of output a year, which is aligned with MEPS for R&D but will require adjustment in the other functions to match it. This would involve BIW producing above MEPS, Powertrain well below it (but within the flat range of its LAC curve) and Final assembly made up of two plants with output of 300,000 units a year. As is now standard in the industry, each of these functions makes use of flexible production to manufacture multiple models, usually variants of one another.

Figure 5.7 Automobile industry paradigm



Since the Final Assembly process has been duplicated it is possible that the output split between the duplicate plants could occur anywhere within the flat range of the relevant LAC, thus the total output could comprise Plant A with annual output of 350,000 units and Plant B with 250,000 units, or even three plants with output of 200,000 units a year. The extent that capacity would be allocated between the plants would depend on company specific factors, for example the larger plant might be a later addition to the company. The company might also have to calculate the degree to which higher unit costs at the smaller plant could be compensated for by lower unit costs at the larger plant.

The simplicity of the paradigm suggests that a simple form of governance structure could be applied, this being the U-Form. Historically most automobile companies have started with this structure, Henry Ford's autocratic control over the company he founded being a particular example. GM under Alfred Sloan then developed the M-Form structure in order to manage the multidivisional strategy. The focus of this thesis is directed more at the strategic matters of size, in terms of access to economies of scale, and structure, in terms of functional internalisation. Nevertheless,

governance structure is relevant in demonstrating how a paradigmatic automobile firm can manage its functions in a dynamic commercial environment. M-Form and U-Form governance structures will therefore be evaluated where appropriate. The following section of this chapter will investigate the empirical evidence collected during the fieldwork phase of this study from elite interview information on the structuring considerations within the industry. This will then feed into the next chapter of this thesis which will examine the various ways that sub-optimal firms can approximate to the paradigm.

5.4 Empirical evidence of vertical integration

The data on vertical integration was gathered as part of the elite interview schedule conducted with senior managers in the automotive industry and its related institutions. Two themes emerged from the collected interview data:

- Degree of functional control
- Extent of vertical integration

Functional control was concerned with the degree to which the companies had control over their core functions. All companies involved were insistent that it was this that gave them a right to a place in the industry. R&D was seen as particularly crucial, and companies were keen to show that where inputs came from external parties this was in a supportive role and not one that impinged on the design authority. MG Rover came to the same conclusion, but only after a process of trial and error. The company had made use of some external engineering consultants but found that the loss of control in the R&D function proved to be a handicap. MG Rover representatives concluded that the company needed to exercise more control over its R&D function in particular and that it benefited from control of its other functions.

Vertical integration showed the extent of the companies' control, i.e. the functions that were necessary in order to compete effectively in the industry and market. Prime amongst these functions was R&D, without which a company could not shape the

final product, but this also extended into control over the production capabilities. Here, where the dependence is on physical assets, vertical integration was related more to the control of output. Honda was notable in extending its corporate structure well beyond what would be predicted by transaction cost analysis, and there was some possibility that this was due to the company culture or atmosphere.

5.4.1 Vertical integration – contextual sources

Interviews conducted at Honda found representatives claiming that the company was a provider of transport solutions and that it was vertically integrated around this purpose. This meant that not only could it be defined as a full-function manufacturer in automobiles, as a group it also took in the original motorcycle operations, a robot research programme and a new jet engine facility. Although those functions that were not related to automobile production were beyond the scope of this study, it was a puzzle as to how they were related to each other. Table 5.1 summarises the various ways in which the exercise of control was conceived by the interviewees to manifest itself at Honda and the implications this was thought to have for the company.

Table 5.1 Honda – areas of control and derived benefits

Data Source	Area of Control	Benefit
Mr D Blume (Jaguar)	Company philosophy	Technical innovation
Mr T Sumita	Research Intellectual property rights	Internal resources Available for sale
Mr T Iida	Company philosophy	Creativity
Mr K Nakamura	Semi-autonomous regional divisions	Market closeness

Table 5.1 shows that the basis of the business was its company philosophy. Honda's culture was emphasised in many interviews, both inside and outside the company (e.g. Mr Iida, Mr Blume), with the company's philosophical stance seen as a source of technical creativity. It was therefore vital for the company to have control over research and the subsequent horde of intellectual property rights which represented the future potential of the product range.

Honda's view was that product differentiation was born out of its control over technology and this was fundamental in a market where consumers made choices for personal reasons. David Blume, president of Jaguar, Japan, felt sure that part of Honda's success lay in its ability to pursue its own programmes. He felt that this created the conditions for the company to develop the highly innovative CVCC engine technology a decade before its alliance with Rover. This put it in a risky, but fertile position:

"... even forcing it to come up with ideas." (David Blume, Jaguar.)

It was clear that Honda placed a high priority on control of its technical assets, the latest example of this being the company's internalisation of fuel cell technology after the early partnership with Ballard of Canada. Mr Sumita described the fuel cell research and how it progressed from a joint venture with Ballard to a sole Honda project. Mr Yoshino, ex-Honda CEO, denied that there was any preset sequence to the relationship, only that in its ultimate form it should be wholly under Honda control. He took up on the financial perspective, namely that if Honda could bring in enough revenue to sustain itself then it could develop wholly owned technologies for the future and further strengthen the potential of the company. The distinction was made by Tatsuya Iida, that Honda had no objection to working with other companies but that sole control:

"...allows us to be creative and innovative, do the things that we think should be done." (Tatsuya Iida, Honda.)

It was quite apparent to this research that Honda maintained a strong integrated structure, despite being spread across the continents. Mr Rogers argued that a core competitive advantage for Honda was its integration of company functions, paying constant attention to designing for production. He contrasted this with engineering consultancies, like Ricardo, that housed "excellent" skills but did not have the capability to see proposals through to production. In Japan, vertical integration even extended into the sales network, though Mr Yoshino mentioned that this was unique to Japan and that overseas it was better to have independent dealers who understood local market conditions. It was therefore apparent that domestic integration, where the

company had the comprehensive knowledge, was more reminiscent of the U-Form structure, but in foreign markets, where it lacked knowledge, it needed to call in external resources. According to the theory of Bartlett and Ghoshal (1993), Honda could have internalised this local knowledge but contrary to the theory it chose to use local knowledge as an external resource to support its integrated structure. It can be assumed that this brought benefits in transaction costs.

This reliance on its own capabilities was at the very core of the company and was said to be the main strategic force. Kenji Nakamura said that when the senior management set the general direction for the company this then allowed workers to have a degree of autonomy within the framework. This seemed to suggest an M-Form of organisational structure, and many commentators discussed the semi-autonomous nature of Honda's global divisions. Hiroyuki Yoshino went one step further and by claiming that it was the policy of the company to encourage each major region to have full-functional capability in "development, production, sales and marketing" he seemed to be alluding to the managerial theory of Bartlett and Ghoshal (1993).

Table 5.2 shows the various ways in which integration is understood at Honda and the benefits reported by the respondents. Some activities took it outside of the full-function structure, such as motorcycle manufacturing, jet engines and robots. This might indicate an M-Form structure, and since there was considered to be a derived technical benefit for the more orthodox automobile side of the business, this hinted at Hill's CM-Form of organisational structure. Jet engines and robots were looked on as a testing ground for product innovations, to be incorporated in automobiles at a later date. Mr Sumita and Mr Iida admitted that none of the technology from ASIMO was used intact in other applications, but the research was fertile ground for additional ideas. In line with this approach, Mr Nakamura stated that Honda encouraged engineers to transfer between different areas of the company and gain wide experience. Mr Kobayashi, in his typically candid manner, pointed out that the publicity generated by such projects was a highly cost effective way of recruiting engineers of the best standard without having to offer high salaries.

Table 5.2 Honda – functional integration and its impact

Data Source	Functional Integration	Impact
Mr C Rogers	Full vertical integration NSX supercar project	Design for production Mainstream innovation
Mr T Sumita	Research: jet engine, ASIMO Automobiles-motorcycles	Future applications Motorcycle production as overseas pilot plant
Mr T Iida	Motorcycle racing project Research: jet engine, ASIMO	Mainstream innovation Innovation for current products
Mr S Kobayashi	Engineer-customer empathy	Honda R&D

However, not all functions were treated equally and interviewees reported that ultimate R&D authority lay in Japan even though overseas locations had R&D centres; Mr Ikeda pointed out that the American head of R&D in the US had spent three years in Japan learning the Honda methods. The production processes tended to have more autonomy but it could be argued that they operated closely to Honda standards. Thus it would appear that Honda's organisational structure was a variation of the U-Form, with foreign extensions being allowed operational flexibility, rather than an M-Form where the foreign functions would have operational control. There was certainly no notion of the managerial theory of the firm proposed by Bartlett and Ghoshal (1993) with regard to the management of international operations.

There was some sense that a matrix format was also emerging at Honda to draw different model programmes closer and exploit economies of scope. Mr Iida stated that as recently as 1992, the CRX model programme had used a dedicated design team that did not share its development with other teams. Mr Rogers pointed out that by keeping the NSX super car project in-house the technologies developed for it permeated throughout the rest of the range, stating that advances in lightweight parts contributed to the high standard of the new diesel engine. The company had achieved similar economies of scope with this 'trickle down' effect before, Mr Iida describing how motorcycle racing had been used to set the technical goal of the company. In any case, Mr Yoshino did not think that Honda was ambitious to move up to higher value models. This indicated that the benefits of economies of scope from premium models were probably quite limited.

Despite the increasingly close working relationship between projects there was a belief that there was further to go. Mr Sumita believed that motorcycle and car divisions needed to work more closely, perhaps to create a low cost entry level car to bridge the gap between the two product types. He also believed that the economies of scope brought an advantage in production when expanding abroad because it could pilot production in a new location using motorcycle manufacturing. Although only America seems to present any evidence for the motorcycle business being used as the corporate spearhead, even at the time that the business was being established in 1979 the planning for the automobile facility was already well advanced (Honda, 2006).

The opening of new plants may blur the distinction between M-Form and U-Form. Using one production system to test the local environment before expanding into another system suggests the M-Form, evaluating the data before sanctioning further allocation of resources. However, since the automobile plant had been planned before the motorcycle plant had been fully established it suggests a more centralised governance structure. It seems that Honda was operating a domestic U-Form with international extensions. These extensions were allowed limited autonomy only where it was necessary to account for local differences, such as marketing and product adaptation, but these adaptations were targeted responses and operational control would be too general a description. As Mr Kobayashi pointed out, and shown in Table 5.2, the company put R&D at the core of the company and in close contact with the needs of the global markets, a strategy further emphasised by having all CEOs promoted from the R&D function. This strategy supports the suggestion of a U-Form governance structure with the functions working closely together and finds its equivalent in other contextual firms. Daigo Umeki, for example, reported that his company, Toyota, had a similar policy to independent development as did Honda:

"We want to make everything by ourselves, otherwise it is very difficult to handle [innovations] and very difficult to find out the root cause [of problems]." (Daigo Umeki, Toyota.)

He conceded that internally generated innovation is not always successful, and called attention to Toyota's poor record in Formula 1 racing with its wholly owned team. Yet if Toyota had acquired another team it would have been dependent on that team's

knowledge base, but by running its own team Toyota internalised the knowledge. Purchase of an established team would have formally internalised it but there would have been no links throughout the company, unless actively promoted.

Table 5.3 summarises the arguments concerning the manner in which divisions may operate within a company structure. This reveals the extent of autonomy enjoyed by the divisions and the kind of facilities they derived from larger parent groups.

Table 5.3 Automobile companies and dependency/autonomy

Data Source	Company	Dependency	Autonomy
Mr D Blume Jaguar	Jaguar	Short-term external synergy with Ford 1 model 30,000 units a year	Long-term internal synergy 4 model range 150,000 units a year Brand differentiation Brand defence
	Saab Ford PAG	GM total control Ford resources	None Semi-autonomous
Mr T Watson Aston Martin	Aston Martin	Jaguar sports car platform (cancelled)	Internal range of platforms
Mr K Yamada Toyota	Toyota	None	Internal knowledge for sustainability

Although GM is famous for implementing the M-Form of organisation, it is clear that it has full operational and strategic control of its Saab division. Conversely, Ford appears to have embraced the M-Form in its approach to the brands within its Premium Automotive Group (PAG) division comprising Jaguar, Volvo, Land Rover and Aston Martin. However, there is no distinct demarcation between strategic and operational issues, neither was it understood whether PAG was the division or if that status belonged to each brand. Jaguar had been dependent on Ford while producing one core model at a rate of 30,000 a year, but in the long-term Jaguar was intended to achieve internal vertical integration with 4 models and output of around 150,000 a year. Mr Blume advocated the view that a sense of independence was needed, even within a larger group, to protect the brand and its future potential at a time when brands like Jaguar were the very future of Ford:

"To protect the brand from its helpers, from being smothered, to maintain some independence within a large corporate entity is very important... To have the independence of the brand's own management to defend what the brand stands for, selfishly and stubbornly, to take the independent view, at the same time recognising that it is part of a large corporation." (David Blume, Jaguar.)

Mr Blume alluded to the situation at Saab where GM had run the operation down to the extent that there were too few people to defend the brand and so the brand would lose its differentiation:

"It starts with you can't command the emotional value added, and therefore you can't charge for it so you become non-premium and a brand falls back into the swamp." (David Blume, Jaguar.)

Like Jaguar, Aston Martin seemed to have both operational and strategic control. It had a dedicated range of vehicle platforms, separate this time even from stablemate Jaguar, yet Mr Watson also quantified the overall beneficial influence that Ford had on Aston Martin sales (see Appendix 6). Mr Watson described how Aston Martin's semi-autonomous status within Ford allowed it to react quickly to market conditions. The example he gave was of proposed derivatives of the DB7, which was approaching the end of its production run, the prototype Zagato version being ready for viewing by potential customers within a year. This suggested a strategic ability to reallocate resources to new model programmes as required. Mr Watson asserted that these were examples of Aston Martin's independence from its parent:

"We are not Ford Motor Company, we are Aston Martin." (Tim Watson, Aston Martin.)

On closer inspection it was found that the governance structure for divisional automobile companies was not that of an established type. Table 5.4 reveals that the divisional companies under Ford and VW had elements of both strategic and operational control such that their own governance was reminiscent of a unified U-Form structure. All of the divisional companies listed show that control of entire product programmes is crucial, the parent being used as a supplementary resource.

This is remarkable given that the parent companies Ford and VW were also vehicle manufacturers, and were indeed the dominant producers in the group. The benefits of the organisational structure appeared to favour the subsidiary company and indicated a system of hidden subsidies. This might suggest the internal capital market of the M-Form, yet so dependent are the divisions on these parental indulgences that it appears that the funds are not being made available internally to overcome imperfections in the external capital market but to mask the inability of the divisions to raise capital independently.

Table 5.4 Divisional control of operations and strategy

Data Source	Company	Level of Control	
		Strategic	Operational
Dr U Eichhorn	Bentley	New product programmes	HR: engineers, engineering management
Mr A Hallmark	Bentley	Body design	Engine assembly
Mr D Dickson	Bentley	Production technology	Component supply
Mr T Watson	Aston Martin	New product programmes Platform technology	Engine assembly
Mr D Blume	Jaguar	New product programmes	

The parent companies imposed some strategies on the divisional companies, such as Jaguar obtaining its aluminium body technology from Ford even while Aston Martin obtained its new platform technology independently. Bentley has responsibility for its new product programmes but based its GT series on the existing VW Phaeton platform and engines. At the same time, Bentley does not have operational control over body production for the GT series since the bodies are supplied by VW.

Throughout the contextual sources all the interviewees were in agreement that control over an internal R&D function was crucial, and this included the divisional companies. This implied strategic control that even divisional companies enjoyed, though supplemented by access to resources within the parent. Furthermore, where the parent company provided finance to divisional companies it was not to correct for imperfections in the external capital market, instead by way of hidden subsidies it seemed to be investing in disregard of capital investment principles. Operational control at divisional companies tended to extend as far as the production systems

which, for historical reasons, remained within the company structure. For example, Bentley manufactured its old V8 engine internally but W12 engine production was more dependent upon VW. At the same time, all the divisional companies had some claim to being full-function organisations.

Although the divisional companies could not claim the complete full-function structure of independent companies such as Honda and Toyota, they had enough to be able to claim similar governance structures. Honda in particular had a centralised governance that was more U-Form than M-Form, even if overseas functions often had a small degree of autonomy. Divisional companies such as Jaguar and Bentley had far more control over their strategy than any overseas Honda function, so although they were dependent upon their parent companies for support there was an argument for describing their governance structures as U-Form based on their strategic control. This is not to say that the parent groups are not involved in divisional strategy, and Jaguar seems to receive a significant amount of strategic involvement from Ford, but this never seems to be consistent. Hedlund's (1994) N-Form of governance structure might be applicable, but there is little sense amongst the contextual companies of the heterarchical structure that the theory proposes. Instead, the empirical evidence appears to suggest that the U-Form has been adapted to the larger companies, perhaps facilitated by some kind of matrix that created temporary networks of management according to the project, whether it was a new car programme or an overseas production plant.

Since MG Rover was almost uniquely small as a full-function manufacturer it might be expected that its strategy would call for a more defined governance structure than was found amongst the contextual companies, anticipating in particular the U-Form. This might then bring clarity to the governance structure of the larger firms.

5.4.2 Vertical integration – MG Rover

Whatever the view of industry commentators on the long-term sustainability of MG Rover, at the time the interviews for this research were undertaken the general consensus at the company was that it had the capabilities to survive as a standalone operation. Although it was conceded that aid was needed in the form of funds and

temporary new products there were no misgivings concerning the integrated state of the company. Table 5.5 collates the comments made by the participants related to MG Rover.

Table 5.5 MG Rover – theoretical and practical considerations of autonomy

Data source	Considerations	
	Theoretical	**Practical**
Mr S McKee Head of International Media Relations	No third party No shared profit No outside equity holders	
Mr R Ball Head of HR Development	Core intellectual property Positive morale	Supporting partners Complacency
Dr C Millard Head of Strategy	Motivation	Opportunism
Mr R Oldaker Chief Engineer	"Fleet of foot" Small team of experts Maintain core skills	Short-termism, tactical not strategic "Difficult to manage" Supporting partner
Mr M Harbour MEP	Internal integration	Supporting partners

Mr Harbour, a previous project manager at the company, raised the importance of maintaining internal integration at MG Rover for its long-term survival. This was a point raised on many occasions: that MG Rover had a distinct advantage in being tightly integrated with all the main functions on one site at Longbridge. In fact, the only facility off-site and not owned by MG Rover was the body pressing facility operated by BMW. Since all other BIW processes were conducted at Longbridge, MG Rover could be considered to be a full-function company.

As Mr Oldaker stated, functional integration meant that the company could be flexible and fast reacting based around small teams of industry experts who embodied the core skills, even if like a Formula 1 team such individuals could be hard to manage. This view found agreement in Dr Millard who felt that people were motivated because they understood that there was "no safety net", contrasting this with Jaguar where he believed that security of employment under Ford must be akin to a nationalised company. He coupled the sense of danger with an awareness of being able to act on opportunities, giving rise to a motivated team of workers. He was a strong advocate of

positive opportunism within an integrated company, and believed that MG Rover was of a good size to exploit opportunities as they came up:

"We can move our business around very quickly to take advantage of opportunities that may present themselves." (Dr Millard, MG Rover.)

Mr Oldaker agreed that as an independent manufacturer MG Rover could be more "fleet of foot", though he added that MG Rover was a "short-term operation" and tended to make tactical rather than strategic decisions. Dr Millard believed that the company had the flexibility that was necessary in the current commercial climate, arguing that an independent company could differentiate its products to compete in a fragmenting market. Mr McKee also noted that the close proximity of MG Rover's facilities created very short lines of communication, and this was particularly illustrated by the abbreviated period of time that it took to develop the SV supercar from the lacklustre X80 proposal:

"...SV styling was changed during a big argument in the car park at Longbridge after the first motor show." (Mr McKee, MG Rover).

As with the contextual companies there was general agreement at MG Rover that R&D was central to the company's future. However, MG Rover was obliged to use external consultants with variable rates of success. Mr Oldaker stated that the reason for MG Rover approaching TWR as a contractor was that it had a more advanced digital design capability than MG Rover as a result of its takeover of Daewoo's design facility, though MG Rover later upgraded its own facilities in order to achieve totally digital design. Although TWR collapsed, and seriously undermined the new medium car programme, Dr Millard trusted in "normal business diligence" to guard against this again. He stated that MG Rover needed strategic control while looking to external design houses for access to technical innovations design. He emphasised the importance of having an integrated approach to car design, stating that he would be interested in adding specific external skills but not in the "wholesale hiring" of another engineering team. The company would thus be able to access specific capabilities without being vulnerable to hold-ups.

Transaction costs came to the fore in contracting with another external consultant, ProDrive, for the rear-wheel-drive large car platform where MG Rover made the dominant input at the initial, defining stage and then the final, finishing stage. The experience had taught the company that using outside contractors was not as cost effective as anticipated: the contractors needed close monitoring by a small team of MG Rover specialist engineers, and the project needed a tight definition at the start to ensure that the contractor stayed within the desired parameters. The transaction costs were therefore higher than had been originally anticipated. Concerning the V8 engine for the project Mr Oldaker reported that MG Rover had very little involvement. Most of the company's work lay in adapting the existing car's electronics to accommodate the Ford sourced engine, while the engine was enhanced and supplied by Ford collaborators Roush Technologies.

While MG Rover was active in defining the limits of strategic control in R&D there was little of this in its other functions. There was no attempt to fill vacant production capacity with assembly for other manufacturers, although Powertrain did supply engines to various other manufacturers, and although the largest of these was Land Rover this was a contract inherited from when MG Rover and Land Rover were part of Rover Group. Strategic control in the functions concerned with production was part of the company's *status quo* and the status of the functions was not developed further. This was not the case with R&D which the company found, by heuristic exploration of external contracts, to be crucial to the strategic control of the company's long-term future. In particular, the company found that the physical assets of R&D could be acquired relatively easily, but that the human assets were more difficult to access externally and so it was fortunate that the company found it had considerable capability internally. It was therefore able to retain sufficient strategic control over R&D while it maintained strategic control over the other three functions almost by default in not developing them further.

The governance structure that would appear to be appropriate for a firm of this size would be the U-Form. Indeed, strong operational leadership from senior management was a feature of the company and Mr Ball described how there was a general feeling that CEO John Towers was "the messiah". More frequently, though, this research found that managing director Kevin Howe was instrumental in all the strategic and

operational decisions. This could have resulted in a company where operational issues were dealt with at the expense of long-term strategic issues, a commonly cited weakness of the U-Form, but it would appear that both these issues tended to suffer. Chapter 7 of this thesis will investigate these matters in closer detail while the next chapter will show what strategic options were open to MG Rover in attempting to compete with firms that had achieved at least MES_P in the industry.

5.5 Conclusion

The investigation of transaction costs has shown that there are two main dimensions to vertical integration: physical assets and human assets. Hitherto, physical asset specificity has been considered to be the main driver of vertical integration, internalisation of these assets being a method of pre-empting *ex post* contractual opportunism. Although there is empirical support for this view it fails to recognise that human assets pervade all company activities, including control of the physical assets. Indeed, opportunism is essentially a human problem, not a technical one. This is because the decision to create a hold-up and appropriate *ex post* advantages is a human one, which then uses the physical assets to extract the benefit. Klein, in particular, has argued that vertical integration is a matter of internalising labour contracts in order to introduce greater flexibility into the production system.

Assuming that companies using the same production technology are operating in the same economic environment, since they are therefore faced by the same transaction costs they will converge on a single form of vertical integration. This is the full-function model which determines the functions that should be internalised within the company boundary. For an automobile manufacturer this should include R&D, BIW, powertrain and final assembly. It is an economic model of vertical integration and it does not denote a particular governance structure or geographic location of function. However, by juxtaposing theories of economies of scale with that of transaction costs it is possible to provide for each function prescribed levels of scale. This results in a model of size and vertical integration structure, but not governance structure.

Vertical integration brings with it control problems that different organisational governance structures are intended to address. According to theory, the unitary U-Form is effective for relatively small firms where the management can take a close operational and strategic role in the integrated functions. Although small firms are unable, by their nature, to exploit the available economies of scale, the simplicity of their structure brings this problem to the fore. The theory of the multidivisional M-Form isolates senior management so that it can specialise in strategic matters and leave operational decisions to the various divisions. The structure has advantages over transacting in the market because the relationship between headquarters and the divisions is transparent, thereby facilitating efficient allocation of resources and capital. This has particular utility when the industry is undergoing rapid development or a company is particularly diverse. The divisions themselves may be single functions or themselves have a U-Form style structure with a number of functions, although without the overall strategic control. The M-Form can bring benefits from economies of scope in the product range and management capability although this can overshadow the pursuit of economies of scale. There are also doubts about whether the M-Form can stretch to an international structure.

The data gathered by this research was very supportive of the need for an integrated structure. This was even to the extent that there was more support for the U-Form than the M-Form structure. This is in line with the notion that the parameters of the industry are fairly stable and the industry has reached maturity, a level of stability that Burton and Obel (1980) and Donaldson (2001) suggest is suited to the U-Form structure. Even large, international companies, such as Honda, maintained a strong focal centre in the domestic market which showed a U-Form structure from which international extensions radiated. Although the foreign operations appeared to have operational control this was strongly influenced from the centre. For those firms which were divisional companies, such as Jaguar and Bentley, they too showed a U-Form integrated structure within a larger group, but this time at a much lower level of scale. This might have implied a holding company H-Form of governance except that the parent company had occasional strategic and operational involvement in the divisional companies. At the same time, the parent company had its own automobile production facilities that somewhat accorded to the U-Form of organisational structure.

In this regard, MG Rover made a crucial case study. It clearly had a U-Form structure with poor achievement of scale, like the previously mentioned divisional companies. However, unlike them, it had to seek its external assistance in the market rather than within a larger group. This resulted in increased transaction costs, such as when MG Rover design projects were outsourced only to be become the victim of *ex post* difficulties. On another occasion, that of V8 powertrain procurement, by surrendering almost all responsibility to the external firm many of the transaction costs were avoided while the company retained strategic control of the project as it related to MG Rover. It would seem that MG Rover, due to the precarious commercial situation it was in, had arrived at a well-defined and lean full-function structure, as prescribed by the full-function model. However, as the previous chapter noted, MG Rover was unable to access the economies of scale prescribed by the same model. Since its organisational structure did not provide it with access to economies of scale, except by going outside of the structure, only a new form of organisational structure would suffice.

The next chapter of this thesis will explore the methods by which a company that is uncompetitive within the automobile industry paradigm can use devices to approximate to the paradigm. In the subsequent chapter, Chapter 7, empirical evidence relating to such approximations will be introduced. In particular, the chapter will focus on how MG Rover had a full-function structure but lacked the scale to sustain itself. It will be suggested that the company could have used its human asset endowments as the basis for an organisational restructuring, which would then have allowed it to retain the transaction cost advantages of a vertically integrated, full-function organisation while obtaining access to the necessary economies of scale. The reasons for the failure of MG Rover to achieve these benefits will also be examined in Chapter 7.

Chapter 6:
Approximating to the Automobile Industry Paradigm

The automobile industry paradigm described up to this point suggests strict conditions for the long-term sustainability of an automobile firm since it is constrained by parameters set by both economies of scale and vertical integration. So far, this thesis has put forward a prototypical size and structure for an automobile firm operating closest to its optimum. This applies principles of economies of scale to indicate plant sizes which, in combination, provide a size for the firm. Transaction cost analysis is applied to indicate a full-function model of vertical integration. The full-function structure is effectively independent of firm size since it is related to the economic friction that exists between operations, thereby driving the make-or-buy decision.

This chapter of the thesis will first examine the cost disadvantages of falling below the required levels of output and then demonstrate how these might be ameliorated internally with different production strategies. Chapter 4 showed that if the MEPS of the automobile company functions are brought into reasonable synchronisation then this would result in the prototypical automobile manufacturer producing around 600,000 units a year at MES_P. It has been found that beyond this optimum point diseconomies of scale emerge, partly due to rising R&D costs. However, firms producing at MES_P are sensitive to changes in output that lead to large variations in costs. As a company grows in output by adding new plants, each designed to produce at MEPS, this sensitivity is reduced so the firm is able to absorb changes in output without suffering the large variations in cost. Furthermore, large firms can diversify risk by offering extended product ranges. These firms are the industry leaders.

Those firms that fall below the MES output are deficient in structure, scale or both. This chapter will investigate some of the strategies by which a sub-optimal company might approximate to the cost advantages of MES described by the automobile industry paradigm.

6.1 Introduction

Firms that fall below the output required for MES_P suffer debilitating cost disadvantages, relative both to the prototypical model and to the industry leaders. Such firms will be deficient in at least one area: either the scale of output is too low, or they do not operate with a full-function organisational structure. They then have to solve their predicament by approximating to the precepts of the paradigm to put them on a convergent trajectory. This is possible using internal or external solutions. Internal solutions could involve more intensive use of limited production facilities through flexible manufacturing, which then reduce the company's exposure to changes in market demand assuming it has the necessarily wide model range. Alternatively, the company might extend the use of the facilities by perpetuating the output of products with unchanged specification for longer periods of time.

In another approach, the automobile firm might seek external solutions by contracting with other firms. Clearly, in the make-or-buy dichotomy, this can mean seeking resources in the open market. However, this is not an approximation of the paradigm but the antithesis of it. Since the full-function model demonstrates cost advantages in its integrated organisational structure, any firm that sources externally as an alternative to the model will suffer cost disadvantages. In order to approximate to the full-function model a firm must find a form of inter-company relationship that represents an alternative to the make-or-buy dichotomy.

Reflecting the two forces that structure an automobile company, there are two ways in which this external partnership can come about. The first is size, where the partners are uncompetitive in terms of quantity. A full-function manufacturer that is uncompetitive in this regard is unsustainable only by relative degree: the further behind the standard set by the industry leaders, the less sustainable it is. This can be corrected through a pooling of joint resources with another company, although some of the advantages may be offset by additional transaction costs. For consistency, this thesis will refer to them as horizontal joint ventures as it involves the enhancement of existing capabilities through sharing with a partner. Naturally, it is a strategy that is also of incremental value to industry leading producers, further improving their relative competitive positions.

A second form of partnership is structural. Here, the company has some functions at the desired size but it is not a full-function organisation. Such a firm is more than simply uncompetitive within the paradigm, it has no prospect of sustainability as long as it is lacking functions; these must be sourced externally. It is possible to do this contractually in the open market, but the full-function model demonstrates that this brings transactional cost disadvantages. To approximate to the paradigm there is the need to develop a vertical joint venture (VJV), a complementary relationship where the two parties bring distinct capabilities to the alliance. An additional strategy may be necessary if scale is still lacking, but if the parties already enjoy competitive economies of scale in their existing functions, then the resultant VJV will be converging upon the prototypical model and so have access to most of the available economies of scale. VJVs have less value for firms that already comprise full-function structures because the strategy implies relinquishing one or more of the functions.

This chapter will show that for firms to come together in a VJV each must have a different structural basis in order to have arrived at their contrasting structures. In particular, the distinction between human assets and physical assets in the automobile industry paradigm implies a demarcation line within the full-function model that might be exploited for the VJV. Specifically, human assets prevail in R&D while physical assets prevail in production. This distinction between asset types may be heightened by the possibilities raised by globalisation. New locations offer a range of different factor endowments, as described by the Heckscher-Ohlin (HO) model, and elaborated on by Dunning's eclectic paradigm; some of the objections to globalisation will also be noted. A firm that is already operating at, or above, MES_P will receive incremental benefits from the different factor endowments to enhance its position relative to its peers. However, for a firm that is at a sub-optimal level of output a restructuring around different factor endowments may raise it to a more competitive position. Thus, not only does an international vertical joint venture (IVJV) have the potential to replicate the organisational structure, and even scale, of a prototypical automobile company, but it can also bring additional benefits due to specialisation.

Throughout the discussion examples will be given of cases that illuminate the theoretical approach so far described. These will develop the potential for joint

ventures as forms of organisation beyond the make-or-buy dichotomy. Globalisation will be examined as a potential source of cost benefits due to factor endowment differentiation, particularly with regard to the division between human and physical assets. This will be applied to the joint venture structure and then further refined to give rise to the IVJV. The following chapter will then examine the empirical research data based on the theoretical principles established in this chapter.

6.1.1 Sub-scale production

The technical advantages of scale production are well documented and Pratten (1971) attributes further benefits to companies that achieve very large volumes. Firstly, R&D costs can be spread over a greater number of units thus encouraging greater research. Secondly, large firms can expand incrementally in plant sizes that each achieves MEPS, depending on the process. Thirdly, a large firm can save costs on designing new plants due to learning effects from previous projects. Finally, larger firms can negotiate discounts on larger procurement contracts of components by extending the benefits of scale into the supply industry. Many of these points were covered in Chapter 4, although R&D was actually found to rise as firms grew in size.

Exploitation of economies of scale may be a fundamental aim of the industry but, as Pratten (1971) has shown, it is not a condition that can be arrived at immediately. Even with a given level of technology learning effects will influence actual output, so firms joining the industry now are at a greater disadvantage than if they had begun with the start of the industry. The Ford company that exists today was actually Henry Ford's third attempt at manufacturing. The vast domestic US market had already proved fertile ground for Olds with the first mass produced automobile and even the famous moving production line was not new (Lewchuck, 1987). Yet, though Ford was aiming to increase efficiency, at every turn it is not clear that the concept of an optimum output was understood. Ford advanced the technology and techniques for production flows to improve production synchronisation with the levelling of production times, yet this strategy is unrelated to the concept of an optimum output that would exploit the economies of scale for individual processes (Tolliday, 1998).

The Ford company attributed its success to its production methods but did not consistently quantify this advantage. The Rouge River plant was designed to be a highly vertically integrated production facility with its own blast furnaces and glass making facilities. Thus, along with the latest company labour practices, the new plant was intended to be the ultimate expression of Fordism. This formula was repeated for the Dagenham plant in the UK. However, it proved beyond the capabilities of the company to match the minimum cost outputs of the different facilities within the plants so that all production activities could be operating simultaneously at MEPS. The Rouge River plant never reached more than 50% of its capacity utilisation (Williams *et al.*, 1994) and where once 100,000 workers produced 1,200 cars a day there are now 3,000 devoted to producing 800 Mustangs a day (Economist, 2002a). Fiat copied the old Ford Highland plant when it built its production facility in Turin, but this simply imported all the original associated problems along with the unsuitable architecture.

In the short-run, it is important that companies operate plants at minimum cost output and that the resultant cost structure is comparable with that of competitors. In the long-run, companies are at liberty to choose larger plants, on condition that the actual output accords to that indicated by the industry LAC. According to Maxcy and Silberston (1959, p.93) the main benefits of a move towards an optimum scale are yielded in the initial stages, as shown below:

1000 units rising	to 5000 units	= 40% drop in costs
50,000	to 100,000	= 15% drop in costs
100,000	to 200,000	= 10% drop in costs
200,000	to 1,000,000	= 5% drop in costs

Of course, the MES_P put forward by this thesis is in the middle of the highest range quoted by Maxcy and Silberston. Pratten (1971) also suggests that the largest benefits in economies of scale are gained in the 100,000 to 250,000 range for a firm producing one model, economies available above that range being those attributed by Pratten to body pressings. Cusumano (1985, p.216) was another who found that Nissan achieved its greatest savings with the first expansion in output, finding a 31 per cent decrease by raising production from 23,000 in 1955 to 130,000 in 1960. However, as the company grew so did the model range and by 1999 the company had 24 global

platforms, five of them taking 62% of output and only one totalling over 300,000 units a year, for a total output of around 2.5m (Automotive Design and Production, 2004). This thesis has found that beyond production capacity of 600,000 units a year the cost advantages can be attributed to diversification of risk, of which a burgeoning product range is a crucial part of the strategy. However, Nissan's example shows that this too can lead to rising costs if it is not controlled.

If the major gains from pursuing economies of scale are found by smaller companies that are expanding, it is also possible to mitigate, to a certain extent, the scale requirements of the Budd BIW process by using stamping dies designed for economic production at low volumes. The short-lived revival of Jensen was predicated partly on utilising soft resin tooling which reduced die cost from £40m to £1m, suiting planned production starting at 300 units a year (Financial Times, 2001a). This is only a small saving since all the other associated costs, such as the presses, remain the same. If the presses are capable of being run at 2m operations a year then there will be an output mismatch if low volume dies are fitted.

There was another option available to Jensen that might have ameliorated the effects of sub-scale manufacturing. The marketing solution would have been the cost recovery tactic where the final product is priced to cover the additional costs of sub-optimal manufacturing (Wells and Nieuwenhuis, 2001). With a published price of £42,650 in 2001 the Jensen SV8 was considerably more expensive than the comparatively high volume Alfa Romeo sports car (GTV V6: £25,240) but similarly priced to other low volume sports cars (e.g. Noble M12 GTO: £44,950) (Autocar, 2001). Although Pratten (1971, p.147) stated that "a higher price can be charged for a non-competing article" it is unlikely that there would be no competition whatsoever, even if it is limited to another sports car or a substitute product; the existence of any alternative would mean that costs still have a crucial role. In any case, price recovery serves only to support high costs of production, it does not address the underlying cost problem itself. This may be achieved, though, by approximating to the automobile paradigm using internal or external resources.

6.2 Internal approximations to the automobile paradigm

Automobile firms will commonly exhibit a full-function structure including MEPS for particular plants and processes. With MES_P offered at a relatively accessible capacity of 600,000 units a year firms are able to expand capacity in units of MEPS. However, if a company finds that its scale of output is short of MES_P, it must find an approximation to it. As a full-function firm there are two internally generated solutions available: either to extend the use of the production facilities over time, thus reaching for the ultimate output levels over the long-term but not the rate of annual use, or exploiting economies of scope by using the facilities more intensively with flexible manufacturing techniques and a broader product range. Although neither tactic achieves quite the optimums prescribed by the theoretical economies of scale they do at least represent a pragmatic approximation.

6.2.1 Extending use of the production system

Extending model life cycles can approximate to achieving maximum panel press usage by attaining ultimate levels of output over time, for example the figure of seven million pressings for the life of a die (see section 4.3.2.2), could be achieved by keeping the same model in production for a number of years. The most famous example of this would be the VW Type 1 (Beetle) which can claim production from 1938 to 2003. It achieved an annual peak of 1.3m units in 1971, well short of the 2m annual optimum for pressing rates alone (as opposed to the BIW process as a whole), but it made up for this with a total production run of nearly 22m that somewhat exceeded the extended life strategy. Other examples would be vehicles such as the Jaguar XJS, which remained in production largely unchanged for 21 years even if total production only amounted to 112,000 (Buckley and Rees, 2002).

Maxcy and Silberston (1959) caution that no matter how much the life of the dies is extended this cannot correct for the disadvantage of running heavy press equipment at low rates. In addition, it does nothing for the operating rates of other functions, although powertrain production is usually boosted by the fact that powertrains have the potential to be shared with other models. Recently, though, it has become increasingly difficult to extend engine production due to the progressive tightening of

engine exhaust emission regulations. Model life cycle extension is therefore a decreasingly appropriate strategy.

6.2.2 Economies of scope and scale in flexible production

Economies of scope elsewhere can have a direct impact on production and the exploitation of economies of scale, the enabling technology being flexible manufacturing systems. Flexible techniques have become a feature of all three of the manufacturing functions since multiple products diversify the risk of output fluctuations. For example, a wide product range means that a high volume manufacturer, like Honda or Toyota, can use one production facility to make relatively low volume, niche products. In final assembly this may be relatively easy to achieve as long as the different vehicles can physically join the production line and the routine nature of vehicle assembly means that the same workers can work on different vehicles with little additional training. Economies of scope can also be found in the body pressing stage because, although the dies for external panels are dedicated to a particular model, internal panels may be common to a range of models. Powertrain production is also amenable to flexible production of multiple products, for example engines tend to be designed and made in "families" that offer a range of sizes. However, since these techniques depend on the manufacturer having a wide range of products on offer then it tends to be a strategy better suited to larger manufacturers, those operating at MES_P or higher.

Economies of scope in common components has the result of raising the utilisation of the production system, but as Clark (1987) noted, this only serves to improve access to economies of scale if it employs production capacity that might have been used elsewhere. Few manufacturers achieve more than 50% usage of their body presses (Maxcy, 1981), so the ability to change dies for panel stamping will raise the capacity utilisation rates of the presses. This does not quantitatively change the economies of scale that are available in panel stamping but it does make them more accessible. This is further improved by minimising the time necessary to change the dies, often possible in just a few minutes (Cusumano, 1985, p.285). These producers also benefit from having a flatter total cost (TC) slope due to higher mechanisation and lower variable costs, reducing the break even point and leading to a rapid increase in profits

(TR – TC = Profit), though also rapid increases in losses if the strategy fails (Rhys, 1972, p.276).

Although flexible production is an opportunity to access economies of scale, it also introduces costs of its own. Even if presses are run more frequently by alternating dies for different models, the time taken to switch dies implies additional costs and does not address the cost of the dies themselves. Nieuwenhuis and Wells (2002) put a total BIW investment cost at between £370m and £515m for one model, including £20m-£65m for the dies (see section 4.3.2.1), so with the simple addition of a new set of dies for a different model, using otherwise the same facilities, the BIW process would be in the range of £390m to £580m for the two unrelated models. Since some of the unseen panels may be shared economies of scope will reduce the total costs but mixed production can never exploit all the available economies of scale, if only because both sets of dies cannot be used simultaneously. Nevertheless, this does at least represent a significant improvement over running plants below the MEPS.

One company, Fumia Design, has even proposed the use of symmetrical outer panels, for example matching front and rear doors, thereby reducing the number of dies necessary per model (Fumia Design, 2006). GM found further advantage in its C-Flex system for welding the panels together. The company uses welding robots that can be simply reprogrammed for different models instead of having to be replaced, resulting in cost savings of $100m per vehicle launch and a plant area reduction of 100,000 square feet (AutoTech Daily, 2002).

Mehrabi *et al.* (2000) suggest a novel form of flexible manufacturing, the reconfigurable manufacturing systems (RMS). These authors see RMS as a quantum advance over flexible manufacturing because it includes the possibility of adjusting production capacity to fit market demand. This implies access to economies of scale for a wide range of outputs rather than achieving a single optimal output with a mix of models. This would be of interest to all manufacturers, but particularly a prototypical manufacturer seeking to reduce the risk of fluctuating output and those below MES_P seeking to reduce the optimum level of output.

RMS is achieved by modularisation of the production process in terms of both hardware and software. As consumer demand changes so one system can be reconfigured into another by the expedient of replacing, deleting or modifying selected modules. However, for such an approach to be effective, the operators would need a resource pool that they could draw on, or deposit redundant modules into, without incurring additional costs. Essentially, RMS reduces production capacity by removing machines but the authors fail to explain how this can be done without leaving those machines idle, and therefore incurring costs. Furthermore, it is difficult to understand how the remaining machines could be employed in a reduced production process unless they were inherently flexible. Under the Mehrabi *et al.* (2000) system this would not be possible since modularisation is contrary to generalism, it only applies to specialist machines.

From the description by Williams *et al.* (1994) of the Toyota Production System (TPS), developed by Taiichi Ohno in the 1950s, it is possible to visualise the underlying logic of RMS in the creation of U-shaped sub-assembly cells, essentially spurs feeding into the main production line. However, Williams *et al.* (1994) point out that this led to duplication of equipment. Furthermore, the purpose of the cells was not to bring flexibility to production but to achieve uninterrupted production flows, bringing the rate of sub-assembly work up to the same speed as the main line. This would then inhibit, or eliminate, the buffer stocks that build up between machines that operate at different output levels, as described by Ho *et al.* (1983). The same situation that is being controlled by buffer stocks can also cause blockages when the buffer is not large enough (Gershwin, 1987) or stoppages if the buffer becomes exhausted. TPS sub-assembly cells constituted an organisational innovation but they had no effect on the design of the main line which continued with linear production flows dependent upon automatic transfer machines (ATM).

Since final assembly operations are characterised by the sequence of activities rather than a specific technology they have attracted many innovations to improve the production flow. Womack *et al.* (1990) have argued that Toyota has shown superior use of the production system by developing lean, or fragile, production. The most well known development is that of Just-In-Time (JIT) whereby inventories at the assembler are kept at the lowest possible levels, necessitating deliveries from

suppliers at time critical intervals (Krafcik, 1988). This involves close relationships with suppliers, the primary ones being termed Tier 1. At the Honda plant in Ohio, for example, 92% of Tier 1 suppliers provide JIT and design contributions, with Bellamar producing seats in parallel with the vehicle for which they are intended and supplying them direct to the production line (Mair, 1994).

The JIT system depends on a self-regulating pull-through production system governed by "kanban" cards and "andon" lights, with the machines and subassemblies organized to minimise labour. However, Williams *et al.* (1994) take the same view of JIT as they do of TPS in general: indeed, they term it the "romance of Toyota". Instead, the authors put the spotlight on Shotaro Kamiya and his Toyota Motor Sales (TMS) division, created using selling techniques learnt in the United States. To keep the production system running it was necessary to maintain the stability of demand and this, according to Williams *et al.* (1994), was the crucial contribution to production made by TMS to TPS, rather than the innovations within the plant itself. By 1975, Toyota had overtaken Nissan and continues to hold this position, taking 40% of the Japanese car market in 2005 by consolidated sales (Automotive News, 2006). Despite declarations of "genbashugi", the primacy of production, according to Williams *et al.* it is the success of the marketing strategy that enables production to operate at high levels of efficiency. This is echoed in Chapter 4 (see section 4.5) which showed that a major source of cost was the fluctuation in output from that which was planned.

TPS, therefore, represents a refinement of the existing production method: the production line is still a linear sequence, there is large scale use of ATMs and the *kanban* system is similar to the system of human chasers used by Ford at the Highland plant. Williams *et al.* calculate that final assembly by Toyota makes up only 14% of the total cost of production anyway, the rest being borne by suppliers using unrelated methods of production. Williams *et al.* assert that Taiichi Ohno understood this primacy of maintaining a smooth production flow by production levelling, flexible manufacturing also helping to achieve this by assembling multiple models. Refinements such as this have led to the progressive improvements in output reported by Rhys (1972, 1999), but not the quantum change that would signal a paradigm revolution in car production. The Nissan plant at Sunderland is recognised as the most

efficient in Europe, yet it is neither quantitatively nor qualitatively unique (Times 100, 2004) and so MEPS is largely unaffected. This indicates that the continuing development of production systems has increased the ability to exploit the economies of scale, but not necessarily redefined the overall MES_P for an automobile company.

If a company finds that internal solutions of extending or intensifying production are not available then it can try external solutions. In the make-or-buy dichotomy the simple option is to make contractually regulated transactions. The problem with this is that it introduces the very transaction costs that the full-function organisational structure avoids and thereby permits those costs to persist in a structural form. Since the company is attempting to get as close as possible to the full-function model expressed within the automobile industry paradigm then an external solution should comprise more than simply transacting for resources in the market. An alternative way by which it can approximate to the automobile industry paradigm is through alliances with other automobile manufacturers. The nature of such potential alliances will be discussed in the next section.

6.3 External approximations to the automobile paradigm

External relationships that are contracted for in the market are part of the make-or-buy decision process and do not represent a novel form of relationship that might approximate to the automobile paradigm. This describes the supply industry but it can also extend even to vehicle assembly under contractual conditions. For example, the contract assembler Magna Steyr assembles eight separate models for thee different automobile companies at its plant in Graz, Austria. These models are variants supplementing production of mainstream models made by the automobile manufacturers themselves. There is a degree of asset specificity since the production facilities are specialised, but the bilateral relationship is balanced by the intellectual property rights being retained by the client automobile companies. Despite an output of 250,000 units a year the plant is fed by six body plants and two paint plants when one each would normally suffice. The firm is not, therefore, benefiting from access to economies of scale and cannot do so as long as its clients insist on the separation of processes by product range (Automotive News, 2006d). The clients are not exploiting

economies of scale through Magna Steyr either, though presumably there are cost advantages over producing at their own plants. Furthermore, the relationship does not represent a novel form of organisational structure since the plant supplements client-owned assembly plants elsewhere. In essence, Magna Steyr is little different to the Tier 1 sub-assembly suppliers, albeit resulting in fully assembled variants of mainstream models. The company is thereby supporting the automobile industry paradigm but it is not operating within it.

When two companies form an alliance they are side-stepping the dichotomy of the make-or-buy decision by entering into a conjoined activity or joint venture. The structure of the alliance depends on the extent that the activity can be divided between the partners. If the activity is not divisible then the partners will pool their resources into one jointly held facility. This is a horizontal, or lateral, alliance where both parties are able to expand their common capabilities in unison. In this situation, both companies are comprised of integrated functions but are seeking to share one or more of them in order to increase output, such as when entering a new market. For example, the NUMMI assembly plant in California started in 1984 (JAMA, 2006), operated as a joint venture between Toyota and GM, and allowed the Japanese company to share in the scale benefits of the facility as it developed manufacturing in the US. The preceding section demonstrated how an internal problem of scale could be overcome with an internally generated solution, such as flexible production. An alliance or joint venture, however, provides an external solution in the form of a partner.

However, if the activity is divisible then it opens the possibility of the partners taking complementary positions, each company retaining its unique capability, in order to form a vertical alliance. In such a situation, the partners are in search of a capability that they had not previously internalised but had perhaps been supplied to them externally through transactions. The vertical partnership might be intra-functional, each partner contributing subsidiary skills within a function, and so each company gains access to a new facet of the range of related skills. The two companies are individually full-function but are seeking augmentation within one or more functions. Alternatively, when neither company has a full-function structure the partners might specialise in complete, self-contained functions within a multi-product production system. When a vertical alliance or joint venture of this nature occurs it is inter-

functional. The partnership offers the possibility of the two companies sharing in a combined full-function structure that grants access to complementary functions that are entirely novel to each of them respectively.

6.3.1 Hybrid organisational structure

Williamson (1991) considered the possibility of an interim form of firm organisation which neither made its transactions on the market nor regulated the transactions through an internalised hierarchy. This intermediate mode he termed the hybrid and it is a structural form made up of an eclectic mix of the two polar opposites, market and hierarchy. However, it is not at all clear how this renders the hybrid structure a distinct form of organisational structure in its own right. The author gives, as an example, the case of the contract between the Nevada Power Company and its fuel supplier, the Northwest Trading Company. This is described as a neo-classical contract because it anticipated *ex post* opportunities, in effect it recognised that opportunism could occur and so enshrined mechanisms for dealing with it when it did so. At such a point the "excuse doctrine" could be invoked, relieving the parties from strict legal enforcement of the contract terms. In this way it escaped the rigidity of a classical contract which fixed an *ex ante* agreement which was then enforced by law.

There is not, though, a clear demarcation between classical and neo-classical contracts. If no contract can be complete, and all are open to some *ex post* exploitation, then contracts of varying corruptibility should be compared as if on a continuum, not as distinct options. Artz and Brush (2000, p.338) found in their research that, instead of a choice between discrete forms of organisational structures, there was a continuous range. This being so, then the so-called neo-classical contracts are simply contracts that are more complete than others because they cover a greater number of contingencies. If items in the contract carry no legal status then they are not binding and only the risk to reputation remains. This may offer an opportunity for arbitration, yet this would exist anyway, whether it was specified in the contract or not. In economic terms the pertinent issue is whether there is a legal contract between the parties, or whether the transaction has been internalised into an integrated firm where:

"...hierarchy is its own court of appeal." (Williamson, 1991, p.274.)

When Williamson puts forward franchise relationships between companies as being hybrid forms he describes how the two parties have greater autonomy than in a hierarchy, but this then entails greater use of rules than in a market in order to protect the interests of the parties. The relationship between a franchisor and a franchisee appears to be unique because of the complexity of what is being supplied. This includes product branding, quality, pricing and even employment policies. A franchise agreement is therefore one that regulates a multitude of transactions between the parties by bundling them into one contract. Yet the essence of the contractual relationship remains the same, it is only that in this situation the contract has been written in recognition of a complex situation. It is therefore unlikely that the hybrid structure is one based on a new kind of contract, all contracts being written to regulate specific relationships anyway.

6.3.2 Co-operative organisational structure

Many commentators have suggested that firms can work together in a manner that is less dependent upon the mechanisms of the market and more dependent upon a spirit of co-operation and a sense of shared destiny. This concept of working together to mutual benefit may represent an alternative to the choice between internalisation or market-based transactions and it has been approached from various stand points.

If a company's planned output is located in that part of the LAC curve that exhibits increasing returns to scale then, rather than produce by itself, it can elect to form a joint venture in order to produce in a larger plant, one that approaches more closely the MEPS output level. Kogut (1991) points out that joint ventures are useful in mature industries where the LAC is already well known. Excess capacity can be eliminated at the planning stage by combining production capacity with a partner so that together economies of scale can be exploited.

Cleeve (1997) looked at Japanese firms entering the UK. Due to the indivisibility of certain production technology the incoming firm might find itself having to invest in more capacity than its intended output required. Naturally this would put the firm in a

position where increasing returns to scale existed, and hence higher unit costs than at MEPS, a situation which could be enhanced by partnering production with another firm. Hennart and Reddy (1997) also found that Japanese firms tended towards joint ventures when economies of scale were larger than intended output, particularly if the incumbent firms were already producing near the optimum.

Kakabadse and Kakabadse (2000, p.114) looked at firm service activities which, being generic in nature, were amenable to joint ventures or consortia:

"The key objective of such arrangements, therefore, is to achieve economies of scale through a beneficial local source delivery to its consortium members."

Weijian (1991) noted that additional benefits came in other areas, such as corporate learning, which could have a significant impact on shifting the SAC curve as personnel become more adept at operating the existing plant. Learning between partners indicates that co-operation brings its own benefits, Wilding and Humphries (2006) putting forward the concept of co-operation as an alternative form of organisational structure that might minimise the need for contracts or vertical integration. This would then support the possibility of approximating to a full-function model in a manner that replicated internalisation and did not involve transacting externally. They found that market-based negotiations brought increased costs when they became adversarial in nature. The authors advocated C^3 behaviour, explained as co-operation using fewer suppliers over a longer term, co-ordination of knowledge exchange and collaboration in planning.

Like Williamson's hybrid form, C^3 seems to underestimate the role that contracts have in the relationship between two firms. Although the benefits of C^3 behaviour are quite apparent, it is not clear how it can be put in place *ex ante* between new partners without some kind of enforcement. Instead, C^3 behaviour is the *ex post* benefit of aligning transactions with the appropriate organisational structure. In a previous paper, Humphries and Wilding (2004, p.1119), acknowledged that this condition of empathy between organisations could not be arrived at immediately, trust had to be nurtured until the full benefits of the C^3 relationship could be realised:

"Organisations should attempt small, simple, co-operative projects that improve efficiency because these are perceived as being non-threatening: discussions about costs should be left until some maturity has been achieved."

This seems to concede that co-operation can be developed if the incremental steps are low risk, and thus the transaction costs are also low. However, this serves the purpose of maintaining the equanimity of the partnership such that one partner cannot assume a significant advantage over the other. Additionally, there is no reason why each "simple" step should not be enforced by a "simple" contract, thus spreading the transaction costs of specifying the ultimate contract over the relationship development period. At the other extreme trust can have a malevolent aspect, as when one partner has a disproportionate amount of power which it can be expected, or 'trusted', to use to its own advantage. Blois (1972, p.268) argued that when a supplier depends to a large extent on one customer then it is quasi-internalised because of the customer's bargaining power:

"In some cases large customers are prepared to indicate that they regard their suppliers as being extensions of themselves."

The concept of regulating company relationships by a spirit of trust in place of either contracts or internalisation has often been applied to Japanese companies. Dyer (1996) used the principles of transaction cost analysis (TCA, see Chapter 5) to look at the *keiretsu* form of alliance structure seen in Japan, particularly in application to the automotive industry. These are vertical buyer-supplier relationships so it is described by the make-or-buy decision of standard TCA but it results in an alliance form of organisational structure. The author found that around 38% of component costs in Japan could be sourced to the *keiretsu* alliance, as opposed to the United States which was much more polarised with 10% attributable to partnerships and 48% produced internally, the remainder being sourced in the market.

One explanation put forward for this difference is that American companies can call on a legal system that is more closely adapted to the characteristics of market transactions while Japanese companies are culturally orientated towards a trusting relationship. However, this places too little emphasis on the *keiretsu* structure. Gilson

and Roe (1993) point out that a *keiretsu* is a form of organisation that anchors a network of companies to a common core, often a bank, and each company is a part owner of the network through a system of cross-holdings. This means that suppliers and buyers in the network are also equity owners, creating a degree of integration that lowers transaction costs and permits knowledge transfers. In a subsequent publication, Dyer (1997, p.548) reiterated the role of trust but acknowledged that:

"A stock ownership position held by an automaker acts as a financial hostage which encourages the supplier to make partner-specific investments."

The asset specificity is therefore founded on a sense of joint ownership and acts as a self-enforcing influence on the relationship:

"Self-enforcing safeguards can control opportunism over an *indefinite time horizon.* Conversely, contracts control opportunism for only a *finite time horizon.* (Dyer, 1997, p.548, italics in original.)

An alternative form of joint ownership might involve retaining specific assets within a jointly operated production system, particularly if the technology is readily divisible. Pires (1998) looked at the relationship between the vehicle manufacturer and suppliers at the VW truck factory in Resende, Brazil. This plant is based in a consortium approach where production is divided into distinct sub-assembly modules. Seven dedicated suppliers have sole responsibility for production within each technologically separable module and must guarantee delivery to the final assembly line. There were hopes that the model could be extended to automobile plants but there are two crucial differences. Firstly, the techniques used in truck production lend themselves to sub-division and, secondly, truck manufacturing is a relatively new activity for VW. Pires also reported that the company had found it more difficult to institute such a style of production at its new Brazilian engine plant in São Carlos. Despite this, the model does illustrate that asset specificity is one that can secure a bilateral agreement when the partners are co-dependents using distinct technologies.

Mariti and Smiley (1983) recognise that firms may share specific activities through horizontal co-operative agreements. This is not a make-or-buy decision because this is

not a supplier-buyer relationship. The two parties have already internalised the activity and wish to share it in order to exploit further benefits. In particular, this allows them to access economic advantages:

"...through co-operative agreements, firms can take advantage of economies of scale in one or more of their production processes while remaining separate entities." (p.439.)

Although the authors argue that this is not simply a market transaction since the agreement excludes other firms, and therefore changes the competitive landscape, this is also the purpose of contracts negotiated in the market. Even when a co-operative horizontal transaction is non-monetary, often involving an exchange of knowledge or pooling of expertise in a joint venture, it remains a transaction even if it does not include physical movements of cash. For example, in 1998 Ford and PSA (Peugeot-Citroen) agreed to work together on the new range of small diesel engines, the DLD family (Diesel Progress, 1999). Both companies had existing diesel engine design capabilities but in combining their experience they were able to realise economies of scope. This is often the reason for engaging external engineering consultancies since it widens the breadth of skills that are available for the project and the Ford-PSA relationship might be seen to be in the same vein.

If the co-operative modes of inter-firm relationship so far described fail to offer an alternative to the make-or-buy dichotomy, Dussauge *et al.* (2004) elaborated on the technological basis of the dichotomy and provide grounds for a new type of organisational structure. The authors categorise collaborative relationships into scale and link alliances. Scale alliances combine similar resources in order to seek economies of scale in a horizontal joint venture. Link alliances, by contrast, are orientated towards knowledge acquisition and combine complementary skills to allow the partners to access skills they have not developed for themselves. This opens access to economies of scope but it has ramifications for the longevity of the partnership because Dussauge *et al.* found that link alliances tend to be more volatile and result in one partner acquiring the other in order to secure long-term access to the overall knowledge base. This is because, the authors argue, link alliances are based on the *ex ante* uncertainty of potential knowledge which, when gained, accrues to each

partner separately and gives rise to the possibility of asymmetric *ex post* opportunities. Naturally, this is the kind of behaviour Williamson warned about in transaction costs and reveals the central role played by human assets in link alliances. Alternatively, scale alliances involve joint learning and continuing efficiency considerations which would be lost if the partnership were dissolved.

In practice the distinction might not be so clear cut. For example, one partner may have the necessary skills but be lacking scale and so from that firm's perspective the alliance is about finding scale through a pooling of resources. On the other side of the relationship the partner may be seeking economies of scope by access to its opposite number's wider knowledge base so will view it as a link alliance. This can be the driving force behind the complementary partnership of a VJV. When the alliance is a link-scale compound form it suggests that the manufacturing strong partner will prefer to break off the alliance once it has found the knowledge it was seeking since it will not need to internalise its partner's production capability. This will then leave the knowledge strong partner marooned without access to scale production. In sum, the link aspect deals with a specific problem which is then solved through the alliance, while the scale aspect deals with a problem that is endemic to the system and is only solved by its continuing operation. Although link alliances may be, by their nature, short-term, subsequent sections of this thesis will show that a link-scale alliance in a VJV can be sustainable depending upon the structure. The next sub-section of this thesis will demonstrate the crucial role that human assets play in business relationships, with implications for link alliances.

6.3.3 Human assets in link alliances

Klein (1988) revisited the relationship between Fisher Body and GM which had become a centre piece in the transaction cost argument (see section 5.3.5 above). The author tackles the idea that contractual imperfections lead to opportunism and hold-ups that can only be resolved by vertically integrating the two parties into one firm. This is particularly relevant to link alliances where the asymmetric development of the relationship can lead to one partner holding an *ex post* advantage over the other.

The original contract between Fisher Body and GM had secured the relationship by guaranteeing Fisher Body exclusive dealings with GM and thereby reduced Fisher Body's asset specificity risk. GM was in turn protected from price hold-ups by a price protection clause in the contract. Joskow (1985) found similar contracts concerning coal supplies for power generation but there would have been far less likelihood of technical innovation changing the nature of the industry. The equanimity of the Fisher Body-GM agreement was disturbed by the exponential increase in demand for closed bodies which Fisher Body was in a position to exploit for its own gain.

Klein asserts that the long-term contract actually caused the problem by constricting the relationship during a time of change. The essential feature of the relationship, though, was not the physical assets owned by Fisher Body but the human assets, which by their nature cannot be owned. The human assets can only be controlled by employment contracts and it was at this level that vertical integration occurred, according to Klein (1985, p.207):

"It is in this sense of owning a firm's set of interdependent labour contracts and the firm-specific knowledge embodied in the organization's team of employees that an owner of a firm can own the firm's human capital."

Vertical integration therefore has little impact on the number of contracts but since it involves absorption of the organisational capital of the other company the nature of the relationship is changed. It was no longer necessary for GM to pre-specify how physical assets should be managed, such as production locations and output, and although the requirement for their use remained without the binding force of legal constraint there was far greater flexibility. Similarly, a link alliance constrains the main driver of innovation, knowledge, which is held by the human assets. If a firm is seeking specific knowledge then it will quit the link alliance when it has acquired it sufficiently. Alternatively, if it has a continuing need to develop the link alliance more than its partner then it will internalise the activity. Although the Fisher Body-GM relationship might appear to be a scale alliance enforced by a contract, in fact it had the character of a link alliance providing GM with access to steel body technology. Since GM's future depended on being able to direct the human assets involved it had the greater need to internalise the operation.

In cases where one partner is seeking specific knowledge then opportunism manifests itself in the form of early termination of the relationship once the knowledge has been gained. For example, Hill *et al.* (1990, p.119) emphasise the risk that is attached to entering foreign markets by the mechanism of licensed production. The authors cite the example of RCA having its colour TV technology expropriated by Japanese licensees. The picture is more complex when the relationship is a link-scale compound. When Toyota commenced production in the US it did so with the NUMMI joint venture plant with GM. Although this provided both companies with scale it also permitted them to learn about each other's manufacturing techniques. As predicted by Dussauge *et al.* (2004), the link alliance aspect was not extended as Toyota went on to establish wholly owned production sites, but the scale aspect was strong enough to keep the joint venture plant in continuing operation.

A compound link-scale alliance that seemed to hold long-term potential in the UK was that between Rover Group and Honda. In 1979 Honda was still a young company, having begun automobile manufacturing in 1963 and exports to the US in 1970. There had been an early attempt at a European production plant in 1963, manufacturing mopeds in Belgium, but this had proven to be more of a challenge than the company could manage:

"The Belgian experience was one of hardship in every aspect of work, including production, sales, development and management." (Honda, 1999, p.137)

The venture exposed the lack of market knowledge and poor adaptation of the product to European tastes. The experience seems to have impressed on Honda its lack of experience in the region. Indeed, its comprehensive lack of economies of scope in management, R&D and product range was quite conclusive. The subsequent introduction of the N600 small car into the US market appears to have been rather tentative, being initially released into Hawaii. The contiguous US was entered with greater commitment with the introduction of the Civic in 1973 and then the Accord in 1975 (Honda, 2004).

After the apparent *débâcle* in Belgium, the automobile market in Europe was also approached with caution. Honda lacked economies of scope in manufacturing knowledge and marketing to which it could gain access via a link alliance. At the same time, the financial damage caused by the Belgium production site made a scale alliance in a shared production facility equally attractive until sufficient demand justified a wholly owned operation. For Rover Group production capacity was not an issue but it was in need of vehicle designs. Although the company probably had the strategic resources in R&D at the time to design its own vehicles, the vicissitudes of the previous few years had conspired to leave it with a tactical need for a new model to maintain its production and market presence in the short-term. For Honda it was therefore both a link and a scale relationship, for Rover Group it was purely a link alliance.

The link-scale theory of Dussauge *et al.* (2004) would have anticipated that the link alliance aspect would last only as long as the need for knowledge persisted while the scale aspect would endure. As will be discussed in greater detail in Chapter 7, Honda soon gained economies of scope from its experience of European manufacturing and markets and the creation of its own assembly operation by 1989 gave it greater access to economies of scale in addition to sharing production with Rover Group (JAMA, 2006), just as had Toyota and GM. This was not reciprocated by Rover Group which revealed a chronic lack of economies of scope in R&D, being capable of developing its own designs for some vehicles, particularly at Land Rover, but barely able to transfer these skills to its mainstream models.

As Dussauge *et al.* (2004) assert, a link alliance becomes destabilised once just one party has gained the knowledge it was seeking. It seems that the Honda-Rover alliance was anchored by the physical asset specificity of the scale aspect in joint manufacturing, and this secured the continuity of the relationship in order to maintain the human assets of the link aspect. As Chapter 7 will show, the alliance was ended by the acquisition of Rover Group by BMW in 1994, which broke the scale aspect of the Honda-Rover relationship and the Japanese company was able to extricate itself from the link aspect. Even so, from that point Rover Group, and its successor MG Rover, retained the Honda sourced technology until the company's demise in 2005.

However, without access to subsequent Honda developments via the link alliance the product technology gradually fell behind the competition.

The complexity of compound link-scale alliances suggests that firms will work together for a variety of reasons, many of which they may not share in common. Firms are not simply motivated by scale or knowledge, there are other factors involved such as differences in the production environment, particularly when the companies operate in spatially diverse regions with inherent factor endowments. Globalisation has increased access to these factor endowments and so suggests that the IVJV may encompass link-scale considerations while offering the possibility of a new form of organisational structure outside of the hierarchical-transactional dichotomy. The possibilities raised by globalisation will be discussed in the next section.

6.4 Opportunities raised by globalisation

Globalisation of trade has brought economic benefits by allowing countries to exploit their comparative advantages and make better use of their factor endowments. The mechanism by which this is achieved is specialisation which allows nations to focus on their strengths and trade the surplus in return for those goods in which their trading partners specialise. Although this is a simplified view of international trade, for example trade will also involve exchanges of goods which are unavailable to the importing country, this section of the thesis will show how international trade has accelerated over the past few decades. However, this trend has also brought with it a great deal of criticism.

The development of international trade based on the principle of free markets in turn offers new opportunities to companies. Instead of being part of an international exchange system, companies can become enmeshed in the economies of other nations through foreign direct investment (FDI). For this to occur, the investing firm needs to hold some advantage that the domestic firms do not possess. At the same time, the foreign location must present an opportunity to the foreign firm that exceeds the risks involved in operating in an alien environment.

Automobile firms have been early explorers of international locations but their heuristic evolution has highlighted the complexity of engaging in FDI. Companies that have attempted to internationalise find that they must account for the benefits of the foreign location as well as the advantages they bring to it. Since automobile firms comprise different production systems a single mode of market entry for the firm is not applicable. International factor endowment differentiation can mean that the firm needs to approach the new market in a selective fashion, with perhaps only certain processes being amenable to FDI.

Automobile firms may also find that globalisation presents opportunities that outweigh disadvantages that it had been suffering in its home market. It might allow a firm to access factor endowments that may favour certain functions over others but which were not readily available in the home base. In this way, globalisation opens the possibility of geographically dividing the full-function integrated structure according to the availability of factors of production. For a company that is operating beyond the minimum output (MES_P) prescribed by the automobile paradigm such a strategy would be of incremental benefit unless the company restructured the existing full-function structure around the new possibility. For such a firm, at or beyond MES_P, FDI is used to enhance advantages it already possesses. The possibilities for a firm operating well short of the optimum prescribed by the paradigm, though, are much greater because of the opportunity to restructure around a new location. Furthermore, because the opportunities are applied only to discrete processes, depending on whether they are capital or labour intensive, it creates the greater potential for vertical relationships rather than horizontal. In this section the nature of globalisation and the opportunities it offers for automobile companies will be discussed, showing that the IVJV is the organisational structure that best approximates to the automobile paradigm.

6.4.1 Globalisation of trade

One of the most powerful arguments for the gains to be made from the international movement of goods is the Heckscher-Ohlin (HO) model. This uses differences in national factor endowments to explain how countries are biased towards either capital or labour intensive production, assuming that the underlying technology is commonly accessible. Although this should lead to specialisation by countries in production to suit their factor endowments this is inhibited by diminishing returns. For a country endowed with labour the progressive attraction of that factor to production will lead to the factor price of labour being bid higher. Conversely, the factor price of labour will fall in a country endowed with capital just as the factor price of capital is bid higher. The two national trends will converge until factor prices have equalised and the conditions for international specialisation have been removed. Schott (2003, p.686) argues that this implies that international industrial development has an end point for each technical process:

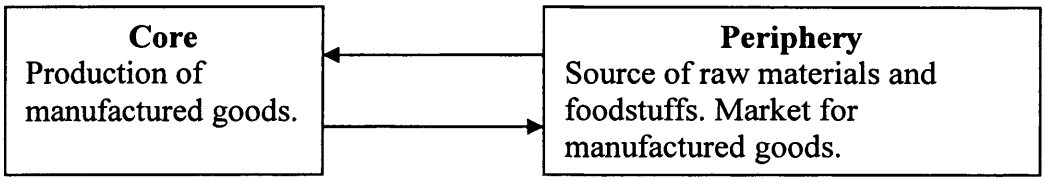
"This single cone version of the model has all countries of the world producing all goods, so that both Japan and the Philippines, for example, are assumed to produce identical electronics and apparel goods using the same techniques."

Based on empirical evidence, Schott (2003) takes the view that industry develops in a dynamic manner but always originating from its factor endowments. Convergence is therefore a tendency, not an absolute. Schott's "multiple-cone equilibrium" would have the Philippines tending towards production of labour intensive clothing and Japan tending towards production of capital intensive high-technology goods. This is even as factor price convergence pulls in the opposite direction with a tendency towards equilibrium in labour and capital. Although countries, or regions, rich in labour will attract capital to a degree, as new industrial developments emerge countries will revisit their persisting factor endowments.

Deepening the HO model in this way brings greater insight to the subtle distinction between the long established practice of internationalisation and the recent rise of globalisation. International trade has a long history and Peter Dicken (2003) describes how this has encompassed many commodities, such as spices, but adds that

production processes used to be organised within national barriers. Trade took place as a result of the factor endowments described by the HO model with a flow of raw materials from the periphery to the core and a return flow of manufactured goods (see Figure 6.1). It is by the mechanism of international trade that companies can internationalise, geographically spreading operations to take advantage of the different factor endowments.

Figure 6.1 Pre-global trade



Source: Dicken (2003)

Berger (2000) points out that there has existed a common understanding since the 1990s that the international economy has changed such that it is now embodied by a single market in goods, services, capital and labour. As predicted by the HO model, the dichotomy caused by the factor endowment differential has been replaced by a blending of the two sides such that the periphery no longer describes a location, the site of raw materials also hosting a manufacturing base. Although internationalisation worked through the mechanism of international trade, globalisation removes the distinction between locations. As Sturgeon (2000, p.3) states:

"The underlying hypothesis is that the more that national economic systems come to resemble one another, the fewer barriers will exist to the flow of resources to their most efficient use, and the further the world economy will become integrated, or globalized."

Yet Sturgeon and Florida (2000) anticipate Dicken (2003) in finding that the ultimate state of globalisation is, in reality, a continuing process and that it has yet to supplant internationalisation. Furthermore, Sturgeon (2000) points out that the degree to which industries can exploit globalisation is uneven and the author finds evidence of globalisation in capital markets, regionalisation in supranational clusters of industry

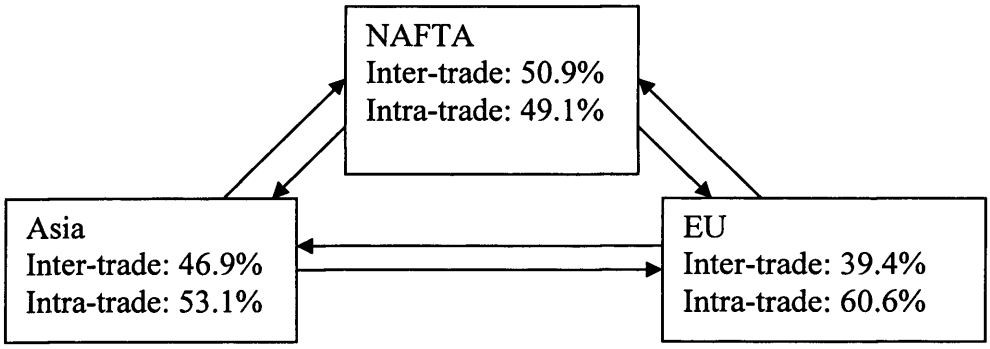
and of internationalisation in national trade policies. Dicken (2003) also distinguishes between internationalising processes, which are characterised by quantitative increases in economic activity between nations, and qualitative globalising processes, which include the integration of economic activities across nations. On this basis, while global markets are measured quantitatively the globalisation of production is essentially qualitative (Sturgeon, 2000).

Applying this to Schott (2003), quantitative increases in international trade will not only bring national industries to a degree of convergence, the increase in opportunities will encourage further innovations that will again differentiate between relative factor endowments. Schott enriches this view of factor endowments by including factors beyond capital and labour to take in factor efficiency, demand, political policies and so on. Yet this complexity is not always well understood by the companies that seek to exploit the advantages, nor the governments that seek to control it. Concern has been voiced on the changes that globalisation is bringing and how companies might use it to challenge existing political authority.

6.4.2 Critics of globalisation

There is little doubt that the globalisation of international trade has brought many economic opportunities. Hill (2003) considered the influence of capital flows, as manifested by foreign direct investment (FDI), quoting the United Nations figures of $60 billion in 1980, $210 billion in 1990 and $732 billion by 1998. Hill infers that this shows the rise of international production systems and the spread by organisations into the markets of their foreign competitors. The caveat to this is that it involves only a select number of countries, with ten developed countries receiving up to 70% of the world's FDI in 1999. In the same year, Africa received a meagre 1% of the world's FDI (Hill, 2002, p.6). Rugman and Hodgetts (2001) also show that while the majority of international trade is between the triad of the North American Free Trade Agreement (NAFTA), the European Union (EU) and Asia, an even greater proportion of the trade is within the individual elements of the triad. Figure 6.2 illustrates this using direction of trade proportions for 1997.

Figure 6.2 Direction of trade 1997 – inter-triad and intra-triad trade movement proportions



Source: Rugman and Hodgetts, 2001

Cowling and Sugden (1998) suggest that the inequality of trade patterns show how trade is not so much free, more that corporations are free to act across international borders. In this context, freedom means the ability to implement strategic decisions. Since these firms are controlled only by those who have a direct vested interest in it, the strategic decisions that drive international trade are made by the senior management of the corporations. Cowling and Sugden (1998, p.347) conclude that:

"...freedom in free trade is the freedom of an elite to manage international trade in their interests, despite the objections of others."

Cowling and Tomlinson (2005) state that the concentration of power in a few transnational corporations puts developing nations at a disadvantage. One such objection came from the Malaysian Prime Minister, Dr Mahathir Bin Mohamed, who laid the blame for the East Asian crisis of 1997-8 on the huge new international corporations:

"Their strategy is simple. Become so big that no one else can compete. The small must either allow themselves to be swallowed or suffer failure very quickly." (World Economic Forum, 2002.)

Some commentators believe that the perceived iniquities engendered by globalisation will lead to retaliation. Polanyi (1963) argues against the commoditisation of three

elements of production: labour, land and money. Essentially, the author sees these elements as being fictitious commodities: land, because it is not in production, and labour and money because they are not produced for ultimate sale. Indeed, they are fundamentally social activities, and so society rebels against their commercialisation in a self-regulating market (Silver, 2003). Furthermore, taking labour out of the market will bring about a transformation as great as the original establishment of the competitive labour market (Polanyi, 1963). Munck (2002) points out that a worldwide expansion of capital will also lead to an expansion in the proletariat, increasing the importance of labour. Even if the workforce has not been globalised yet:

"...there is the tendency towards the creation of a global labour market" (Munck, 2002, p.11).

Countering this are social forces that would retain the differences in factor endowments. Trade unions such as Britain's Transport and General Workers Union (TGWU) are sensitive to the risk of jobs being moved overseas as a result of the opportunities presented by international recruitment (Benady/TGWU, 2003). Cowling and Tomlinson (2005) note the existence of international institutions, such as the WTO, and the rise of consumer groups that seek to force a "corporate responsibility" programme on corporations, but nevertheless conclude that the power of MNEs to conduct their own strategies has merely been mitigated, not banished. Although Bartlett and Ghoshal (1993) suggested that the M-Form of corporate structure was unsuited to coping with making resource allocation judgements for globally dispersed operations, the example of Ford seems to show that control from the strategic headquarters can be highly effective. The company's strategic management compared information gathered at individual plants as the basis of threats to the local employees for moving production elsewhere (Beynon, 1984). The company was also able to use the information to put pressure on political authorities, one example being the 1977 engine plant in Bridgend, South Wales. Of the £180m required £115m came from the British government.

According to Barnet and Müller (1974, p.41) the strategic management of a global company, as seen in the M-Form structure, is able to coordinate all the factors of production, whether mobile or immobile:

"It is this ability of World Managers to weigh all these factors and to co-ordinate decisions on pricing, financial flows, marketing, tax minimisation, research and development, and political intelligence on a global level that gives the world corporation its peculiar advantage and extraordinary power."

Hymer (1972) claimed that this represented a unification of world capital and labour which reduced the independence of nation-states. This view is based on Hymer's theory concerning the manner in which MNEs can use the advantages they have developed in their own markets to exploit advantages in new markets, despite the fact that they are operating in an alien environment. This will be discussed in the next subsection.

6.4.3 Foreign direct investment

Although the comparative advantage theory of international trade can trace its lineage back to David Ricardo in the 18th Century, the manner in which firms can use it as an enabler for their own international structuring has only recently been articulated. Until Hymer proposed a new approach to foreign direct investment (FDI) in 1960 the accepted view of such foreign commitments was that they were a form of portfolio investment (Rayome and Baker, 1995). Portfolio investment committed funds which exploited differences in interest rates but without securing operational control (Hymer, 1960). Hymer took the view that this did not sufficiently explain FDI since funds for the foreign operation tended to be raised locally and, in any case, the resultant distribution of FDI did not follow the availability of low interest rate opportunities but industrial ones. Instead, Hymer concluded that firms would wish to have some control over the foreign operation in order to reduce competition and secure the full financial benefits of their capabilities. The funds that were raised locally to fund the investment were only benefiting from interest rate discrepancy by coincidence; the main purpose was to obtain sufficient funds to achieve at least minimum control of the project. Indeed, by exploiting a low interest rate environment for FDI the flow of capital would be the reverse of that predicted by the theory of international capital movements (Hymer, 1960).

Hymer's theory arose from the imperfections in the international market caused by the lack of integration between national markets. This meant that firms could leverage the advantages they enjoyed in their home market, perhaps because they had developed there earlier, and apply them in new foreign markets where companies had yet to evolve to the same state or did not have access to the same resources. The internationalising firm would thereby find additional advantage in the foreign market over its home location (Yamin, 1991). However, this advantage could only be exploited by drawing on resources in both countries and the advantage would have to overcome the disadvantages of operating a business in an unfamiliar environment (Kindleberger, 1984).

In situations where an existing local firm is, or has the potential to be, fully competitive with the internationalising firm then Hymer contended that FDI would eliminate competition, perhaps through merger, acquisition or some other form of collusion. This occurs when the firms are in an oligopolistic situation such that a coordinated relationship would bring increased rewards. Hymer's theory was further refined by Kindleberger in order to articulate the nature of the market imperfections, culminating in the Hymer-Kindleberger theory of FDI (Rayome and Baker, 1995). These imperfections included:

- Departures from perfect competition in goods, for example product differentiation and pricing strategies.
- Departures from perfect competition in factor markets, for example patent laws, differential access to capital and management skills.
- Economies of scale.
- Political intervention

However, the Hymer-Kindleberger theory has been criticised for focusing on the endowments of the investing organisation and for not including costs that might apply to such factors as the planning of the investment or the financial burden of the acquisition. The theory was therefore not predictive of the precise form of resultant corporate structure or how it came into being (Rayome and Baker, 1995). This was because Hymer appeared to be unaware of Coase's theory of the role of transaction

costs in structuring firms, a criticism that is not shared by Horaguchi and Toyne (1990). They point out that Hymer was not simply describing FDI in terms of the proactive exercise of market power, but also reactive in attempting to minimise costs through internalisation. Hymer (1970) noted that this influences the governance structure of the multinational firm. In its local operations it needs to adapt to local conditions using decentralised decision making, while in its international operations it needs centralised decision making in order to coordinate the flow of information.

"They must therefore develop an organizational structure to balance the need to coordinate and integrate operations with the need to adapt to a patchwork quilt of languages, laws, and customs." (Hymer, 1970, p.445)

This seems to suggest that the M-Form of decentralised governance would suit domestic firms while the U-Form would provide greater control over the disparate foreign functions. The empirical evidence that was discussed in Chapter 5 of this thesis similarly found that international companies tended to use a U-Form with extensions into overseas markets.

Caves (1996) took a new perspective on Hymer's theory when observing that FDI tended to occur in a select number of industries. He noted that as the national firm considers FDI it needs to confront the costs of the expansion. Transaction costs imply that the firm will exploit opportunities in the domestic market until such a point that the marginal returns to its expansion begin to decline. The empirical data reviewed by Caves indicates that firm size is the most reliable indicator of the move abroad, yet firm specific factors will have enough impact to render the decision details largely unpredictable. Since the internationalising company carries disadvantages of being alien to the new environment it will seek to minimise the information costs by approaching the most familiar foreign markets first. At the same time, it has already gained an information advantage, perhaps concerning production technology, in its home market which can be used to offset the other disadvantages of operating in an alien environment (Calvet, 1981).

Buckley and Casson (1998) consider the theory by Caves to be static since it focuses on firm-specific competitive advantage, choice of location and determination of firm

boundaries. Although this is not to say that Caves is in error, the theory is incomplete by not taking into account market volatility, the role of uncertainty and managerial capabilities. Flexibility is the key to the actions of the company within an international environment that is in a state of flux, so the accompanying theories of FDI need to reflect the dynamic developments.

6.4.4 Dynamic theories of FDI

Vernon (1966) takes the dynamic view of global operations in his theory of product cycles. The cycle follows the product from its initial development and introduction to product standardisation and maturity. The theory considers matters of economies of scale, the timing of innovation and the distribution of knowledge. The argument is that entrepreneurs in a location will have the best knowledge on products to release and thus innovation in that product will be initiated in its home market.

"All of these considerations tend to argue for a location in which communication between the market and the executives directly concerned with the new product is swift and easy, and in which a wide variety of potential types of input that might be needed by the production unit are easily come by." (Vernon, 1966, p.195)

As the product evolves during its life-span it passes through three main stages (Jones and Wren, 2006):

- Product development process – product specification and production process uncertain, production located close to intended market
- Maturing product – established product and production process, economies of scale take precedence over location
- Standardised product – fixed product and production process, low pricing strategy takes precedence

As an example, Vernon shows that high labour costs in the US have meant a growth in such innovations as automatic washing machines and drip-dry fabrics. During the first stage in the product's development in the market place there are strong locational

factors, such as a need for close control over the evolving product and communication with the market demand. As the product gains in popularity it matures into a standardised product which is generally acceptable, price then becoming the differentiating feature. Consequently, economies of scale come to the fore and production location may eventually move to a low labour cost region. Thus, as the industry grows, supply shifts from home production for the home market to export for foreign markets and then imports back to the home market from foreign production sites. Should the popularity of the product decline then companies will begin to exit the industry while the remainder restructure. Calvet (1981) sees the shift in emphasis of location as being a response to the loss of competitiveness as the uniqueness of the product is diffused, international expansion being the attempt to capture the remaining rent from the product's development.

Antràs (2005) takes Vernon's point on communication and analyses this from the transaction cost perspective, communication being expressed as friction and therefore incurring transaction costs. Whilst these costs are high, during the period when the product is still poorly defined and market demand has not yet coalesced, R&D and production are internalised. Even when the product has become standardised and production has moved abroad then Antràs argues that the move into the new market creates uncertainty due to the lack of knowledge and this is then alleviated by FDI which maintains the internal functions of the firm. Vernon (1979, p.256) similarly took the view that firms would reduce risk that was derived from their lack of knowledge:

"...firms are acutely myopic; their managers tend to be stimulated by the needs and opportunities of the market closest at hand, the home market."

Vernon (1979) emphasised that R&D tends to reflect the resources and market characteristics in which it is located. Yet even when there are cost advantages to producing in a foreign location the firm may still not have enough information to make the decision to restructure. This may require a "trigger", a point at which a threat becomes clearly quantifiable. This threat may have varying relevance depending on where the firm is on the product cycle. Almor *et al.* (2006) divided the firm's activities into three parts: R&D, marketing and production. They see R&D as

determining the firm's competitive advantage during the early introductory phase, supplanted by the importance of marketing during the growth phase and finally production during the product's maturity phase. The locational advantages remain constant throughout but become relevant to different firm activities as they come to prominence. Early R&D, as Vernon noted, has a strong bias towards the home market but as the product output grows marketing takes an international perspective followed by the internationalisation of production.

Almor *et al.* (2006) note that with three factors driving the international growth of the product, internationalisation of the company cannot be measured by the location of production alone. Indeed, a significant problem for Vernon's product cycles is when it concerns a class of product, such as electronic devices or automobiles, which are conceptually standardised yet being continually updated. Klepper (1996), instead, prefers to take the industry as the unit of analysis and refers to the industry life cycle where innovation in product and process is developed concurrently. In such a circumstance, technical R&D is likely to be retained in its original home location while market oriented R&D would be distributed throughout its target areas in order to develop local variants. Production might drift towards low labour cost locations but continuous R&D innovation in processes would still require a substantial presence in the home market.

FDI is therefore not a simple matter of systematically moving production at predetermined points in the product's cycle, although this may indeed be one of the factors to be taken into consideration. Buckley and Casson (1981) investigated the factors that need to be accounted for when deciding on FDI and found that in addition to the costs of servicing the foreign market it was also important to evaluate the demand conditions and future growth potential. Porter (1986) gives four factors that lead a company to seek competitive advantage through global expansion. These are:

- Economies of scale
- Co-ordination advantages
- Proprietary learning curve
- Comparative advantage of the location

However, these do not necessarily apply equally to all globalisation situations. The first brings competitive advantage if it enhances the ability of the company to approach or achieve economies of scale but would inhibit an international move if the new production site was a substitute for existing output. Having coordination advantages is relevant only if it is applicable in the new location to a greater degree than the incumbents.

The proprietary learning curve is gained in the home location but this can be disturbed by an international move that introduces new elements. For example, in an assembly operation the position on the learning curve will have been achieved after experience has been accumulated by the workforce, and although much of the technical learning can be transferred, the workforce in the new location will, nevertheless, have their own operational learning curve to climb. Under these conditions, a firm would expect to use its established home base as a foundation for exploring international expansion incrementally. This suggests that a firm would retain its existing governance structure as far as possible, such as the U-Form or M-Form, depending on the complexity of the organisation, rather than implementing a new governance structure that was flexible enough to accommodate regional differences. Yet as Vernon (1979) observed with the "myopic" management, the *status quo* of the current industry leaders may inhibit them from taking the risk of restructuring and so destabilising their competitive positions. This would involve the firm progressing in stages, establishing or learning at each stage before going on to the next. The Uppsala Internationalisation Model takes one such behavioural approach, the firm deepening its foreign involvement due to the management push to learn and the pull of market demand (Buckley, 2002). It is made up of four stages. These can be summarised as follows (Barkema *et al.*, 1996):

Stage 1 – no regular export
Stage 2 – exports through agents
Stage 3 – offshore sales subsidiaries
Stage 4 – overseas production

Clearly, Stage 1 shows no significant internationalisation even if no firm is entirely insulated from the greater commercial world. Stage 2 takes a product into the international market via agents but has little effect on the operation at home

(Andersen, 1993; Viitanen, 2002). Stage 3 brings a commitment to a specific overseas market, possibly with some custom product design, and the company might establish a degree of physical presence through franchising, licensing, joint ventures and strategic alliances (Hill *et al.*, 1990). The progressive internationalisation culminates in Stage 4 where the firm is operating in the foreign market as an incumbent. At this point, the firm might claim to be globalised if the operations are integrated with those in the home base. Conversely, if the existing governance structure is retained, foreign operations might also constitute a simple extension of the domestic operation.

It should be emphasised that stage models describe the company ratcheting-up its exposure to foreign conditions and this implies that it is going through different levels of commitment, yet it would be facile to state that globalisation is reached incrementally. Any corporate activity is incremental if the opportunities are fertile; to state that globalising companies expand by stages is simply to describe the growth of success. The only types of firm that can avoid any kind of incrementalism and instantaneously globalise are those of the 'born global' kind. Bell *et al.* (2001) have described such firms as small, entrepreneurial organisations that can draw on a sophisticated knowledge-based infrastructure but this hardly describes the large scale, technically mature automobile company described by the automobile industry paradigm. Aw and Batra (1998) in a study of Taiwanese manufacturers found that small and medium firms used geographical diversity in place of the product diversity enjoyed by large firms. This indicates that FDI is not a strategy open only to those firms with a strong, home base but also those that are seeking to counter disadvantages at home or whose opportunities are global by nature.

Johanson and Vahlne concede that there are exceptional circumstances when stages can be omitted because the learning is inconsequential or has been gained elsewhere. The three exceptions cover instances when company resources are large enough to render the risks of intermediate steps relatively containable, situations where the market is homogenous and occasions when the market is similar enough to other markets for experience there to be relied upon. Each of these exceptions seems to describe large automobile manufacturers that can expand in units of MEPS (i.e. constructing new plants that have all the size benefits of MEPS) within a reasonably

globalised market. Since the stage model theory focuses on the role of the company one might also add the opportunity to learn from other companies, or first movers.

Johanson and Vahlne (1990) defend the stage model theory because learning effects account for a reverse flow of information which then influences the progress of internationalisation towards globalisation. This two-way process is part of the integration that characterises the degree of integration necessary for globalisation. Indeed, it may be a problem for any theory of internationalisation that the nature of globalisation is progressing and reducing the alien nature of foreign locations. This does not mean, however, that there is no differentiation between home and foreign locations, but it does mean that it has become more complex and subtle than Hymer originally envisaged. The eclectic theory, or paradigm, has arisen to draw together the different theories of FDI by applying them to different perspectives. This is discussed in the next sub-section.

6.4.5 The eclectic paradigm

Although company learning must influence the progressive internationalisation of a firm, the stage model theories do not specify what knowledge is necessary in order to embark on the next step. Not only are the theories not normative but, in allowing exceptions, they also fail to be completely descriptive. They therefore connect poorly with the HO model since they do not emphasise the complex differentiation of factor endowments.

Cheng and Kwan (2000) studied FDI in China and found that local market size, infrastructure conditions, wage costs and political policies were all positive factors for inviting foreign investment into the country. Furthermore, FDI seemed to be self-reinforcing in that once the process had started it was easier to encourage more, suggesting that the FDI companies had their own internal factors for making the investment. This level of complexity cannot be contained within the foregoing theories of FDI but instead is better served by the eclectic theory which seeks to reconcile the different approaches (Dunning, 1979). The eclectic paradigm is more able to encompass such complexity since Dunning (1979; 1981) formulated it to include factor endowments in three forms, known as the OLI parameters (Ownership-

Location-Internalisation). These encompass the constituent approaches as follows (Dunning, 1979):

1. Ownership advantages – industrial organisation and ownership theories
2. Locational advantages – theories of international trade
3. Internalisation advantages – theories of vertical integration

This takes a broad view of factor endowments and includes various kinds of assets. Although the parameters are customarily referred to in terms of OLI, Dunning (1979) states that for FDI to take place they are conditions which should be satisfied in a sequence better described by ownership-internalisation-location:

1. The firm has possession of net ownership advantages, in the form of intangible assets, when compared to other firms in the same market.
2. It is then more beneficial for the firm to exploit these advantages internally rather than pass them on, by sale or lease, to an external source.
3. The preceding two advantages are better utilised in conjunction with a local factor input in the foreign market (e.g. natural resources)

Dunning (1980) summarises the OLI elements as the ability to call on resources that the competition cannot, the extent that the company's resources are better retained within its structure rather than being obtained from an external source and the profitability of exploiting these resources in conjunction with the indigenous resources of a foreign location. Dunning (1979) warns that the theory does not indicate which firms will engage in FDI or where it will take place, although Dunning (2000) identifies four main types of firm which can then be linked to other theoretical approaches:

1. Market seeking – Uppsala Stage 2
2. Resource seeking – HO model factor endowments
3. Efficiency seeking – HO model specialisation (Schott, 2003)
4. Strategic asset seeking – enhancement of ownership advantage (Erdener and Shapiro, 2005; Bailey *et al.*, 1994)

It is notable that the theory acknowledges that advantages are not evenly distributed, opening the possibility for more dynamic approaches to FDI, such as Schott's (2003) theory of international trade. The eclectic paradigm shows production processes can be separated into constituent parts and transferred globally in order to exploit differentials in factor endowments. As Schott demonstrates, this does not conclude the process of globalisation since new developments will change the relevance of factor endowments, even within Dunning's OLI categories. This has already been observed within Vernon's product cycle, but it is tempered by the TCA approach which would inhibit the infinite division and dispersal of production processes, instead restricting this to technically separable processes.

This needs to be borne in mind since Dunning's approach, by the fact that it is eclectic, offers a myriad of possibilities. Williams (1997) emphasises that ownership deals with intangible assets, such as the access to parent facilities at a cost below the market rate in the new setting or the benefits of existing economies of scale. Dunning (1979) points out that a country might improve its stock of intangible assets by promoting a higher than average expenditure on R&D. This would have the consequence of raising its revealed comparative advantage. Ownership is also a control issue, comparable to Porter's (1986) co-ordination factor, and introduces some sense of human asset specificity. Locational advantages are more closely related to the factor endowments described by the HO model, though Williams (1997) explains that these include, amongst others, trade barriers and tax regimes. For example, UK government policies have influenced choice of location, from intervention by way of the Industrial Development Certificate of the 1960s (Adeney, 1988), to inducement by way of financial incentives later in the 1980s and beyond (Garrahan and Stewart, 1991). Dunning (1979) explains that this means locational advantages are dependent on the fit between the characteristics of the location and the nature of the investing firm. Dunning (2000, p.178) seems to anticipate Schott (2003) in noting a shift from the attraction of natural resources, or factor endowments of the basic HO model, towards:

"...a distinctive and non-imitatible set of location-bound created assets."

Even these can change. For example, Ford of Canada being established to supply the nations of the British Commonwealth from inside the tariff regime (Wilkins, 1979). Subsequently, Anastakis (2004) observed the shift in ownership of Ford of Canada from a semi-autonomous operation to an internal division of the Ford Motor Company once the trade barriers between the US and Canada had been dismantled. Locational advantages can also include the existence of local industry clusters offering economies of concentration that the incoming firm can exploit using its existing ownership advantages (Buckley and Ghauri, 2004).

Site specificity takes a narrower view of plant location advantages, including local rather than national characteristics. Table 6.1 contains a short summary of three automobile plants in the UK and the reasons given for the selection of site. The common features of this list are the existence of good transport communications, a large labour pool and the availability of an existing industrial site. Nissan and Honda constructed new factories over the sites of old airports but with excellent road communications. Ford sought out port access and built on a greenfield site, more accurately described as a marsh, paying the price by having to build the foundations on 22,000 concrete piles and exceeding the budget by £2m (Collins and Stratton, 1993).

Table 6.1 Plant site selection criteria

Plant	Start of Production	Reasons for Site
Ford, Dagenham	1931	Logistical communications Labour pool
Nissan, Washington	1986	Existing site Local labour pool Government incentive
Honda, Swindon	1992	Existing site Logistical communications Labour pool

Sources:
Dagenham, Washington: Georgano, 2000
Swindon: Mair, 1994

The internalisation element of OLI is directly related to TCA and the avoidance of market imperfections. This is pertinent when transacting across national borders

where alien legal structures may raise the risk of opportunism and thus transactional costs. The make-or-buy decision facing the firm is solved by a range of solutions, from hierarchical, wholly-owned FDI to market-sourced licensing and franchise agreements (Dunning, 2000). The investing company would particularly need to protect its knowledge base, suggesting a tendency towards FDI (Erdener and Shapiro, 2005). Bailey *et al.* (1994), suggest that this may be part of monopoly capitalism, emphasising a strategic defence against oligopolistic rivals.

6.4.6 Strategic FDI

The eclectic approach provides an overview of a company's FDI activity within the context of the industry, but firms will also act in their own strategic interests. For example, although Hymer had rejected the portfolio approach to foreign extension as inadequate, Miller and Reuer (1998) found that diversification of exchange rate risk was a driving factor behind FDI since it provided significant hedging advantages over exporting. Cowling and Tomlinson (2005) mention the ability of multinationals to exercise strategic control over production, employment, investment and advertising as a route to higher profits. For example, VW consolidated its two underperforming North American plants on its operations in Mexico so it could operate that one plant more efficiently (UNCTAD, 2002). The attraction of low labour cost may also be weaker than previously thought. Erdener and Shapiro (2005) found that low labour rates are not crucial to the FDI decision and instead the motivation is towards the establishment of strategic assets, locating plants in order to more effectively service the local market rather than exploit cost differentials.

To be fair to Hymer (1960), the less well known FDI motivator in his theory was the desire to eliminate the competition. Buckley (1990) suggests that MNEs can use their international coverage to raise entry barriers to the industry, cross-subsidising those markets that are most vulnerable to new competition. It is entirely reasonable that a company should have control over its functions, or else it could hardly lay claim to being a company at all. Yet if the purpose is for higher profits then it might be valid to suggest that strategic control is used to change the emphasis of the economic decisions rather than to take their place. This being the case then strategic decision

making only has value to the degree that it brings benefits that exceed those lost through implementing a Pareto inefficient plant.

Should another firm find greater cost advantages within the OLI theory, perhaps by retaining a low labour cost location, then it could find itself at an advantage to the firm that had elected to invest in a higher labour cost location for a strategic purpose. In other words, if the strategic risk is miscalculated then the strategic decision will be rendered a disadvantage. Buckley (1990) pointed out that in a static approach to FDI, for which the OLI theory has been criticised, organisational structures are likely to converge to an equilibrium, so it can be further argued that FDI based on strategic decision making is likely to have a more variable element to it. Buckley argues that internalisation brings long-term advantages because the benefits are relative to the market, but competitive advantage is more transitory since it is relative to other firms. Strategic decision making might therefore be concerned with exploiting temporary competitive advantage. Since risk aversion depends on the decision makers within the firm it can be suggested that strategic decision making is a characteristic of individual firms and not a part of the underlying structure of the industry.

Strategy may also take precedence over labour costs as a technique for dealing with labour organisation. Cowling and Sugden (1998, p.76) discuss the strategic "divide and rule" concept whereby a company will eschew the cost advantages of maintaining a single plant and instead extend into foreign plants in order to prevent labour from unifying itself in opposition to the company. Whether this actually happens depends on the risk of labour being unified in opposition to the company and the degree to which the company is averse to this happening. There may even be an element of Williamson's concept of "atmosphere". Yet if this decision is a balance of strategic advantage and economic cost then it can only be made with knowledge of the cost considerations contained within the OLI theory. It is not an alternative decision making process since any strategic decision implies a prior evaluation of the economic benefits of the alternative. Indeed, Table 6.1 shows that even if there were a strategic reason for the firms concerned extending into the UK as a production location, at the same time those sites had an economic foundation.

If a firm does engage in FDI for strategic reasons then it is entirely reasonable to expect a strategic response from rivals, a possibility that the OLI model of FDI would not account for since it is not concerned with strategy. The response may result in a defensive merger between local rivals or an aggressive extension into the FDI firm's home market (Jones and Wren, 2006). This seems to argue that firms may make a strategic decision to invest abroad based on reasons that are in defiance of the advantages set out by the OLI theory. They may even engage in FDI to match the strategies of rival companies, Kuemmerle (1999) observing industry trends in the progressive internationalisation of R&D. This opens up a multitude of possible strategies, such as strategic alliances that access economies of scale, partner specific expertise or allow a low risk entry into a new market. Buckley and Casson (1998b) added cultural factors, trust and psychic distance to the more quantifiable factors of location and internalisation seen within the OLI theory. Yet even with the additional sophistication of their proposed model, the authors conceded that it assigned a passive role to national governments which may have their own, strategic, reasons for encouraging FDI. On this level alone FDI can become highly complex, with governments setting defined limits to permitted FDI while the investing companies may perceive heightened risk in some countries over others.

Obtaining information is therefore crucial to reducing risk, but it is not unique to the strategic theories of FDI. Johanson and Vahlne (1990) criticise the eclectic model for assuming that managers have access to perfect information. It is the impossibility of achieving this that leads firms to be biased towards ownership advantages, about which it has accumulated knowledge from its own operations. Strategic FDI may therefore be a method for dealing with information deficiency. In order to preserve the advantages a firm has in an alien environment it can enter in stages, not in the systematic approach prescribed by stage models, but to progressively learn about the OLI factors.

Jones and Wren (2006) argue that the area of greatest strategic importance is that of knowledge, with particular reference to R&D. Borensztein et al. (1998) found that FDI was effective in the transfer of technology and led to greater economic growth, demonstrating why national governments tend to be enthusiastic supporters of FDI. A caveat to this, though, is that the benefits were only realised if the host country had

sufficient technological resources of its own to integrate with the incoming advances. Where this is not the case the FDI is left isolated from its immediate industrial environment and the nation obtains fewer benefits.

This suggests a crucial role for international alliances and Dunning (1995) concedes that the OLI paradigm needs adjustment in order to explain how joint ventures can open an avenue to additional knowledge by forming a mechanism for extending the firm's ownership advantages beyond its formal boundaries. Alliances permit access to new information but learning is a dynamic process, interactive with the environment, and alliances will only stabilise if they are structured to account for the destabilising influence of new knowledge. Since knowledge is contained within human assets this represents the keystone of an alliance. Kuemmerle (1999) found that FDI in R&D sites was on the rise, but that the purpose was to extend existing R&D from the home-base. If the foreign R&D operation was intended to augment existing knowledge then it tended to be tied to institutions such as universities, whereas if it was intended to exploit existing knowledge then it tended to be tied to a production facility.

Beamish and Makino (1998) expanded the typology of JV structures to reveal the complexity of international relationships beyond the customary view of a JV between a foreign firm and a domestic incumbent. The study found that these "traditional" joint ventures had the potential for superior performance but had a high failure rate. For Dussauge *et al.* (2004) this style of JV, dependent upon exchanging knowledge, might be classified as a link alliance and the increased possibility of opportunism would impose a short lifespan on the agreement. A stabilising factor is suggested by HO and OLI theories when differentiated factor endowments provide the circumstances for specialisation within the full-function structure. Promising though this approach is, it implies a radical restructuring, even deconstruction, that the strategic theories of FDI may not anticipate. Much of the reason for this is that firms are orientated to using strategies to exploit their existing capabilities, not to restructure around new ones. For example, this research concluded from survivor analysis that as firms expanded their product range and plant output the risk from fluctuating demand was diversified. For such firms additional overseas plants represented gains to the firm as a whole, rather than gains specific to the new plant. Conversely, smaller firms may use FDI to restructure as the antidote to a weakness in

their position in their home market, perhaps because they are operating below MES_P overall or MEPS in particular processes.

To put FDI into an empirical context, the next sub-section of this thesis will investigate the progress Ford made in its early years as it learnt to tackle the complexity of evolving an international structure with different governance structures that reflected the opportunities.

6.4.7 Ford: a failure of global structure

As Burton and Obel (1980) stated, the U-Form of governance structure is suited to companies that are relatively small, a condition most companies are in as they first become established. Ford retained this structure as it grew from its Mid-West base, the production expansion that extended across the home US market, and then Europe from 1911 (Georgano, 2000), involved assembly operations building up components shipped in from the main Detroit factories. As Tolliday (1998, p.59) points out, the Highland Park and subsequent River Rouge plants were designed as predominantly component manufacturing plants supplying dispersed branch assembly operations. In 1921, of the total built-up vehicle output only 9.5 per cent originated from Highland Park, the rest coming out of the various assembly facilities. Ford opened thirty six branch plants between 1912 and 1925 in order to assemble cars close to their local markets. Two of these, Chicago and Minneapolis, could assemble up to 200,000 a year, but many were at the 40,000 level and utilised the earlier stationary assembly methods.

As Ford developed its international expansion it would have been an opportunity to implement an M-Form structure so that local managers could be at liberty to procure components locally and adapt products to the local market. From 1912, local production of certain components was permitted for the UK plant at Trafford Park but at the same time Ford rigidly imposed its "American system" of work practices, such as fixed day rates of pay, and this brought the company into conflict with British work practices at that time (Lewchuck, 1987). British managers attempted to ameliorate the American influence by adapting work practices to suit local conditions, and even after Ford in Detroit culled the local UK management in 1924 and installed a new team, it

too found it had to change American methods to suit local conditions (Tolliday, 1998). Yet Ford of the US persisted in its authoritarian rule from the centre. European sales were collapsing and Ford fell from first to fourth in British rankings, behind Austin, Morris and Singer, mainly due to Ford's failure to give the Model T an engine that suited the local tax regime, leading to the product being priced out of the market (Wood, 1988). Most extraordinary of all, after the Great War, the British arm was even compelled to produce only left hand drive vehicles in common with the US (Tolliday, 1998).

It would appear that a weakness of Ford's style of U-Form governance structure at this time was that it was inadequate at accommodating the dynamism of foreign markets. Vernon's product cycle would have forecast that the Model T would find a receptive market in the UK since it had set the standard for the industry elsewhere. In the event, neither the product nor the production system, both now icons of automotive history, were entirely applicable to an alien environment. As suggested earlier, the product cycle theory needs to allow for the standardisation of the concept after which continuous adaptation and development takes place. In Ford's case the company missed its chance to adapt the Model T, but it did address this in 1932 when the company released the Model Y for the British market, a new product originally designed in Detroit. Its popularity induced the British arm to surreptitiously conduct its own limited R&D to adapt the product. This was comparable to the emerging M-Form structure then taking root at GM but at Ford it was instead met with a definitive restatement of control from the central management in the US. As leading Ford manager Charles Sorenson testily telegraphed to the chief engineer at the Ford Dagenham plant, A R Smith:

"SMITH. ARE YOU AWARE THAT WE ARE CONTROLLING DESIGN OVER HERE. SORENSON" (Quoted in Tolliday, 1998, p.67).

With the U-Form structure held largely in place it was not until 1937 that Dagenham was allowed, despite continuing American resistance, to take on greater local powers and initiate a replacement for the Model Y of British origin. This became the Prefect, later joined by the Anglia variant, and Ford moved back up to third place in the UK rankings for car production (Wood, 1988, p.66). Up until then, the company had been

conducting operations in the UK, quite overtly, as an integral part of the U-Form structure in place within the United States and with little reference to UK national differences. For example, local information such as conditions of tax regimes, labour practices and market demand had been largely disregarded. The more conspicuous information had been transparent and the company recognised the need to minimise transport costs exactly as it had in the home market, and also to evade punitive local tariffs by assembling locally from supplied complete knock-down (CKD) kits. The unified, authoritarian approach of the U-Form had not been sufficiently developed to cope with the local complexities, only the more conspicuous matters of entering an alien environment, and it was only when Ford stretched to a more multi-divisional M-Form that it was able to exploit opportunities specific to the UK market.

The move towards the M-Form allowed the British arm of the company to develop within the local environment while benefiting from central strategic support. In particular this might have been the economies of scope that can become available under the M-Form. Considering the state of development within the industry at the time this change in governance structure brought Ford into line with GM. However, this research programme has found that in the current industry the U-Form appears to have reasserted itself amongst manufacturers such as Honda and Toyota, albeit with sufficient adaptation to local conditions. This suggests that although the move to the M-Form by Ford brought benefits based on divisional empowerment the greater benefits would have come from adapting the U-Form to its international extensions. For example, the Model T began to fail on the UK market because it lacked the correct engine and steering configuration, not because it was inherently unsuitable. The Model Y seemed to correct the problem, being an American design adapted to local conditions, but thereafter Ford abandoned centralised control and gave the British division both operational and strategic control based on its own R&D capability. From this point the British operation seemed to take on a domestic U-Form of governance appropriate to its strategy of being a largely insular UK based automobile manufacturer.

In the process of this evolution, no attempt was made to account for UK factor differences in the wider sense proposed by Schott (2003). It might be conceded that the economies of the US and the UK were closely aligned at the time so the

differences would have been slight, nevertheless, there was apparently no indication that the Ford Motor Company was seeking to restructure around the opportunities raised in the British industrial environment. This is demonstrated by the lack of influence by the UK branch on the US operations as part of a dynamic interchange between the two branches. This does not mean that Ford was not aware of the principles behind the OLI theory, indeed the three factors seem to have been very much part of the FDI plan. The weakness was that the corporate governance structure was ineffective in fully evaluating the value of each factor, particularly that of location. Instead, the company seemed to act more in accordance with the strategic theories of FDI in taking a manufacturing position within the UK market which was not strong enough to offset the weakness in the underlying economic considerations. As was suggested in the preceding sub-section, strategic FDI cannot be implemented in ignorance of economic factors.

If strategic approaches to FDI have a role it is when the industry is standardised and the market globalised, at which point the economic factors are embedded. For example, a company might establish a plant in a location to match a rival's FDI strategy. Since the production technology and degree of local R&D will by now be part of the industry's *status quo* the strategy will be concerned with competitive advantage (Buckley, 1990) and the benefits will be incremental. The M-Form of governance structure might be sufficient for FDI of this level, but as Bartlett and Ghoshal (1993) suggest, it would be insufficient for accommodating the full range of opportunities offered by international environments, such as in the dynamic form espoused by Schott (2003). This research concluded in the preceding chapter of this thesis that the centralised style of the U-Form could be adapted by large firms to the demands of operating in overseas environments. An alternative approach, though, applicable to sub-optimal firms below MES_P, would be to restructure around the opportunities suggested by Schott. The next subsection of this thesis will show how a firm can be restructured in recognition of these international opportunities.

6.5 Reassessing the full-function structure

The full-function model contains the four main functions for a prototypical car firm and since the underlying cost factors are common throughout the industry the full-function structure has become a feature of the industry (see Chapter 5). On the basis that integration means internalising the responsibility for economies of scale then in principle the options for structuring are polarised: a function is either integrated or it is not. Alliances that take place at the sub-functional level, whether of the scale or link type, introduce additional transactional costs. Scale alliances seem to be more stable but their benefits are static and the alliance lasts as long as the specific plant. Link alliances are apparently more volatile due to uncertainty in knowledge development leading to *ex post* opportunism. However, in a VJV where the division of the link alliance is at a functional level, then the benefits of knowledge development accrue to the partner that has sole responsibility for that function. There is less possibility of opportunism and so the partnership remains bilateral. This in turn indicates that a VJV structured functionally is likely to be stable in the long-term.

Although the theory of the VJV, and the IVJV version, has been laid out it is by the nature of the alliance that empirical examples are difficult to source. For the VJV to be formed both partners would have to be in one of two conditions:

1. Have complementary functions that are deficient in scale which they are prepared to abandon in the interests of restructuring around a VJV
2. Deficient in the full function structure to a complementary degree (i.e. the two organisational structures are able to dovetail in a VJV)

In the first condition a firm would need to have the courage of its convictions, and the trust in its partner, to restructure solely for the benefit of the VJV. In the second condition both potential partners would have to be operating without functions that competitors deemed crucial to long-term sustainability. They would therefore be in an unstable condition and dependent upon some kind of support not accessible to rivals (e.g. government funding, consumption of internal funds for survival). The opportunity to form a VJV in the second condition would therefore only last as long as the support remained in place. The next sub-sections of this thesis will examine

examples of vertical relationships in the automobile industry. The first, between GM and A O Smith, is used to demonstrate the stability of a vertical relationship. The second, between Rootes Group and Iran Khodro, shows the possibilities in an IVJV.

6.5.1 Vertical joint venture at GM

General Motors was organised with a novel form of corporate governance structure, the so-called M-Form (Williams *et al.*, 1994), a bureaucratic structure for dealing with the management of internalised functions. Under William Durant, the company had been constructed from a collection of unconnected assemblers and suppliers for the same reason that Henry Ford had brought functions in-house, but the economies of concentration in GM's home base of Flint meant the company did not have to internalise processes to the same extent as Ford (Chandler, 1990).

This was illustrated by the previously discussed occasion (see section 5.3.5) of GM purchasing Fisher Body in 1926 (Coase, 2000; Klein, 2000) which may be contrasted with the following long-term contractual relationship with the functional supplier, A O Smith, a chassis supplier to GM in 1932. The two companies had been in a close, almost symbiotic, relationship for years and R H Coase (2000) found that even the production method was tailored to GM's needs, exhibiting the characteristics of *de facto* vertical integration. In a co-dependent, long-term relationship the interests of the companies are served best through the maintenance of the stability of the relationship rather than jostling for a position of dominance. Williamson argues that when asset specificity is high:

"...buyer and seller will make special efforts to design an exchange that has good continuity properties" (1981, p.555).

The example of A O Smith shows that high specificity can enforce a bilateral relationship (Williamson, 1998). Furthermore, because each company occupied a discrete function there was a reduced possibility of opportunism since any *ex post* advantages would accrue to the partner responsible for the function. Clearly this was not vertical integration as long as the two companies were under separate ownership, though the relationship was indeed a vertical one since A O Smith's responsibilities

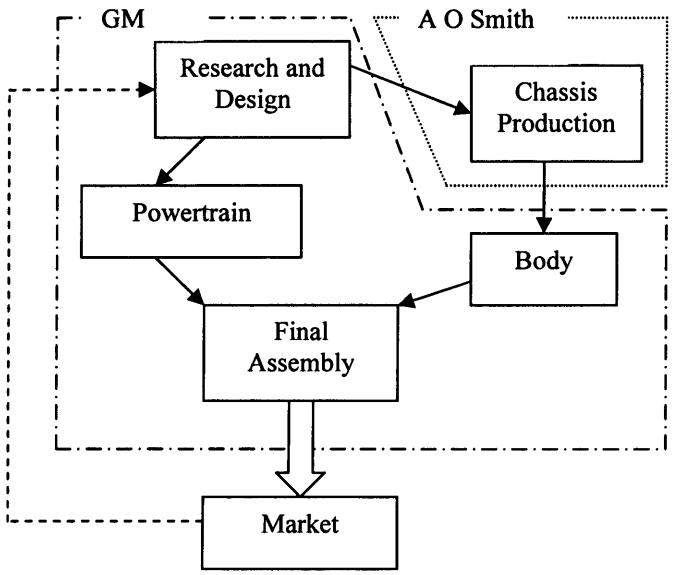
occupied an upstream position in the production process. Etemad *et al.* (2001) found that when the supplier specialises enough a co-dependency arises and the authors' proposed "interdependence paradigm" states that this relationship can be stable over the long-term.

The elegance of the solution to the internalisation question by A O Smith and GM is in the manner in which operational functions could be internalised to the relationship. As independent companies they were not extending beyond their established competencies. They were also at liberty to take advantage of innovations when they occurred and compete within the industry for additional business. Later, when the all-steel unitary body was changing the industry, GM was free from the costs of restructuring a chassis production unit, this being an externality to GM that A O Smith had to deal with. At the same time, asset specificity was a mutual problem, A O Smith specialising in chassis production and GM having no such capability. This was the basis of the interdependency that enforced the quasi-internalisation of chassis production. From this flowed the benefits of internalisation, such as a reduction in principal-agent costs of information searches, uncertainty, and contractual imperfections. With chassis output tailored to GM's assembly output the production processes of the two manufacturers would have converged, thus the economies of scale for chassis production were accessible to GM.

The relationship between the two companies predates the Budd all-steel body paradigm, the chassis being manufactured using distinct technology, so chassis production was a separate function from body production. A O Smith was therefore a functionary supplier, i.e. it had responsibility for the function of chassis production. Given the diverse range of activities that were held under GM's M-Form umbrella of governance it is interesting to note that A O Smith was not internalised. If economies of scope existed in the M-Form then it would be expected that they would be effectively exploited by such internalisation. The fact that this did not take place demonstrates the value in the structure of the relationship in the form that it developed. This put A O Smith in a vertical position within the production process and in a close working position with GM, so although the relationship was not termed a joint venture it is reasonable to characterise it as such. Figure 6.3 illustrates the relationship between A O Smith and GM as a VJV. This has been adapted from the

full-function model to show a pre-Budd era production system. It demonstrates A O Smith's critical position within the production process, the supplier's hold-up power being balanced by GM's status as sole buyer.

Figure 6.3 Vertical joint venture between A O Smith and GM



A VJV depends on the supplying partner having responsibility for the complete production process that defines the specific function. With the two being thus interdependent, the relationship is self-regulating and stable in the long-term, A O Smith continuing as a chassis supplier to GM until 1990, finally moving out of the industry altogether in 1997 (Assembly, 2002). However, this strategic relationship does not seem to fit any explicit form of governance structure. Although this thesis has cast doubt on the efficacy of the M-Form of governance, particularly due to the difficulty in separating strategic management from operational management, in the case of GM and A O Smith this division appears to be more distinct. While A O Smith would have retained operational control, it is quite feasible to view strategic control as lying with GM since it determined vehicle design and therefore chassis design as well as product demand. At the same time, the crucial feature of the M-Form, which is the transfer of objective data from operational units to headquarters for strategic analysis, would have been missing. From this one example a definitive judgement on the governance structure for a VJV cannot be made, but this may become clearer by investigating further aspects of the VJV relationship. Since it would appear that a VJV can be stable if the assets are divisible, it would be

instructive to investigate how else an organisational structure, usually expected to be vertically integrated, might be divided. The following sub-sections will do this from the perspective of human assets and international opportunities.

6.5.2 Human assets and the full-function model

Chapter 4 of this thesis compared the output of the three manufacturing functions (BIW, powertrain and final assembly) with the R&D function, showing that diseconomies of scale set in early with R&D. Research has suggested that much of this is due to the rising staffing levels of larger departments. Clark *et al.* (1987, p.766) stated that Japanese companies were able to counter this and find a relative advantage through project management:

"In the best of the Japanese projects, a heavyweight project manager leads a multifunctional team, in which problem-solving cycles are overlapped and closely linked through intensive dialogue."

Although the presence of a "heavyweight" project manager implies a large team, it is noticeable that the multifunction structure indicates that the team is made up of smaller groups. As Cooper (1964) pointed out, a multi-group large team cannot entirely replicate the efficiency of small teams and he noted that larger R&D departments have disproportionately higher spending levels (see section 4.3.5). This results in decreasing returns to R&D investment and reveals the existence of diseconomies of scale. Within a full-function company the economies of scale captured elsewhere must compensate for the diseconomies in the design function or else the model would not be sustainable. Smaller companies, those with sub-scale production output, suffer the reverse effects. They might have small design functions that exploit economies of scale while the manufacturing functions are hampered by sub-optimal production.

The difference between R&D and the manufacturing functions is the relative importance of human assets. Klein (2000) has shown that vertical integration is essentially concerned with securing human assets within a hierarchical company structure. Since R&D is concerned with the flow of new products to differentiate the

firm R&D must be crucial to the long-term prospects of the firm. It is therefore vital for the firm to control the R&D assets by internalisation of this function and the human assets that comprise it. The volatility of link alliances shows the uncertainty involved in attempting to share this function with another firm.

The three manufacturing functions also make use of human assets but to a much lesser degree. As Klein (2000) demonstrated, internalisation of physical assets is concerned with gaining hierarchical control over the human assets that operate those physical assets. Thus, the physical assets of production are integrated for reasons of managerial control; the human assets of R&D are integrated for reasons of access to knowledge. In combination they form one discrete production system: the full-function model. Factor endowment differentiation offered by globalisation indicates that advantage might be found in dividing the integrated structure according to the distinction between human and physical assets. The following sub-section provides an example of an IVJV that demonstrates some of these attributes, and suggests a possible form of such a VJV that could have been beneficial to MG Rover.

6.5.3 International vertical joint venture: Rootes Group

In the 1960s, Iran was seeking to industrialise and had identified the car industry as a potential catalyst. The country was endowed with a large labour pool as well as natural resources, most particularly oil, which provided it with the funds to import capital. However, it had little existing industry and so was weak in engineering skills, the human assets of technology. It was therefore necessary for the company to import foreign vehicle designs for local production.

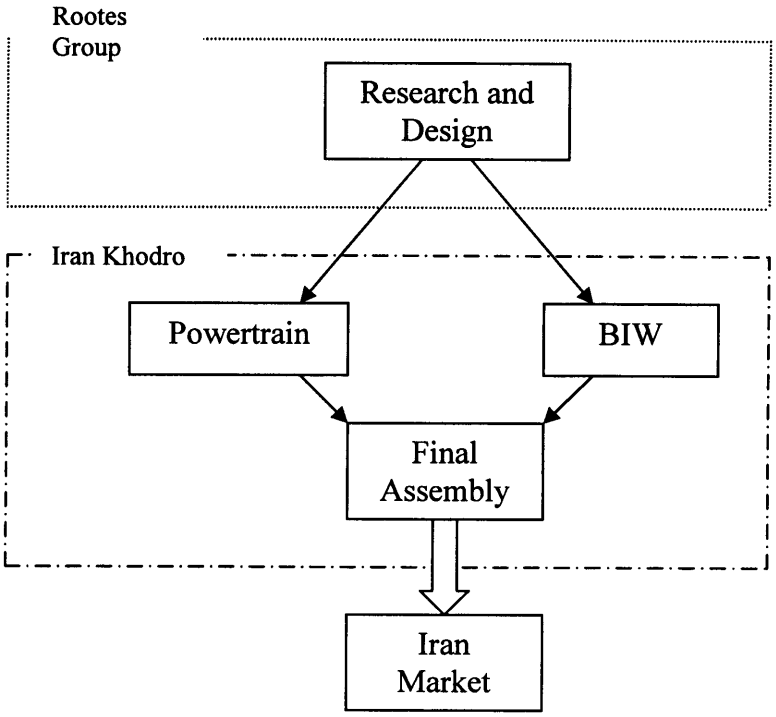
In 1967, the British company Rootes Group licensed the design, and initially supplied CKD kits, of the Hillman Hunter to Iran Khodro. In Iran, this model was known as the Paykan, Persian for Arrow, which had been the Rootes Group project name for the car. Rootes Group changed ownership over the next few years, in 1967 being acquired by Chrysler and then subsequently by Peugeot in 1979 when Hunter production in the UK was brought to a close. However, CKD kits were supplied until 1985 and then production continued with local component supplies. By 1993, the Iranian operation

became 98 per cent self-sufficient with output capacity of 120,000 units per year (Iran Khodro, 2004).

Up to this point, the relationship between Rootes Group and Iran Khodro had been asymmetric in character since there was a difference in the significance to the two parties. Under the terminology of the theory put forward by Dussauge *et al.* (2004) the relationship had aspects of both link and scale alliances. Access to the Iranian market provided useful additional output for Rootes Group, while for Iran Khodro it was principally a link alliance, providing access to vehicle design. As the theory of Dussauge *et al.* predicts, the scale aspect of the partnership was relatively long lasting with body panels being pressed in the UK even beyond the end of the Hunter's production life. The link side of the relationship was very short lived, constituting simply the supply of the original vehicle design.

From Iran Khodro's standpoint the relationship could be characterised as a VJV, and this is illustrated by Figure 6.4 below. This shows Rootes Group supplying the R&D in the form of a finished product design, while Iran Khodro was engaged in the majority of the production. It is not, though, how the model would be depicted from the Rootes Group perspective since the output for Iran was supplementary to all other functions and so would be described as a scale alliance. The mismatch in perspectives is partly explained by the HO model of relative factor endowments between the two countries and Schott's adaptation of it. Without vehicle designs Iran Khodro would have found it very difficult to conceive its own products, so accessing the engineering human assets at Rootes Group in the heart of the British car industry also suggested some locational advantages. For Rootes Group, though, the situation is complicated by the fact that production in Iran was simply an addition to the UK plants which were, at the time, fairly competitive within the domestic UK industry. Furthermore, as Schott (2003) suggests, factor endowment differentiation is complex and political factors had a great bearing on the partnership for the British operation. Government support in Iran of the nascent domestic industry would have made the abandonment of production in the UK by Rootes Group highly risky. Similarly, the eclectic paradigm shows that the locational advantages of production in Iran would have been outweighed by the risks of transferring production facilities to an uncertain political environment.

Figure 6.4 VJV between Rootes Group and Iran Khodro: Iranian standpoint, 1993



The role of the Rootes Group in the partnership was to solve the specific problem of Iran Khodro's need for a vehicle design. Once the design had been supplied, the R&D side of the Rootes Group had no more contributions to make, at least until the problem of a subsequent vehicle design arose. In the meantime, the Paykan was developed further by Iran Khodro using later Peugeot technology, the ageing model being refreshed by building the old body style on a Peugeot 504 platform. The partnership was deepened when Iran Khodro designed its own vehicle, the Samand, on a Peugeot 405 platform (Iran Khodro, 2005). Although the partnership with Rootes Group as a long-term scale alliance and a short-term link alliance had been in accordance with the theory of Dussauge *et al.*, given even more time in partnership with Peugeot the link aspect reasserted itself. Since Iran Khodro at least had the ability to develop the Paykan further, the need to replace it did not occur until sometime in the 1990s. It was then able to do this in a new link alliance with Peugeot, one unrelated to its link alliance with the Rootes Group. This indicates that in a link-scale combination alliance, the scale aspect secures the partnership in the long-term

and so allows the link aspect to continue from one project to the next, which Dussauge *et al.* show would not be the case for link only alliances.

The scale alliance aspect continued because the problem of scale is endemic to the manufacturing system, while link alliances tend to provide solutions to specific problems. A scale alliance is therefore predicated on the nature of the physical assets, while link alliances are predicated on the knowledge contained within the human assets. In combination, link-scale alliances can exploit the divisibility of a firm into functions that favour either physical or human assets. Iran Khodro could readily act on this since it was lacking the R&D capability, but for the Rootes Group it would have been far riskier to abandon a production capability which was, at the time, still commercially viable. For this reason, the relationship can only be depicted as a VJV from the Iran Khodro point of view, for the Rootes Group it was a horizontal joint venture in production only. It cannot be said to have been a true VJV between the two partners because the Rootes Group never relinquished its production capability in favour of Iran Khodro.

However, as it was, it did provide some additional perspective on the divisibility of hitherto integrated company structures. The spatial division of human and physical assets, according to factor endowment differentials, can also be viewed as a type of link-scale alliance when it brings together R&D and production capabilities which are geographically separate. It might be considered a hypothetical question whether the M-Form of structure could have coped with internalising Iran Khodro into Rootes Group, yet the reality is that the M-Form cannot be applied when national interests regulate against it. It is not simply that Rootes Group were prohibited by the Iranian government the opportunity to consider the question, the prohibition was part of that internalisation calculation since it raised costs to an impossible level. It has been discussed previously that the M-Form is a bureaucratic device for accommodating diversity as long as it is limited in scope, failing to account for the full range of opportunities that exist in international locations.

This then raises the question of the kind of governance structure that would be suitable for an IVJV. This thesis has argued that the U-Form has the most suitable control mechanisms for an international enterprise, but it is not generally possible to

have a centralised decision making process within a JV. Indeed, an IVJV may require a particular governance structure of its own to manage the strategic structure of the combined operation. For further investigation, this thesis proposes that for the main case study company, MG Rover, a link-scale combination alliance could have been structured along functional lines in an IVJV, each partner maintaining control of discrete functions such that any *ex post* advantages would accrue to that partner. The empirical evidence for the potential of such an IVJV will be discussed in the next chapter of this thesis.

6.6 Conclusion

This chapter, building on the analysis conducted in the previous chapter, has described the implications for an automobile company of not achieving the structure and size put forward by the automobile industry paradigm. The chapter has examined various ways in which a company, uncompetitive within the automobile industry paradigm, can approximate to the paradigm. Internal approximations include extending production over time or intensifying production through flexible production techniques. However, neither strategy deals directly with the cost disadvantage of sub-optimal output, although they may ameliorate the effects.

External approximations to the paradigm involve making alliances with other firms. Although intermediate forms of governance have been suggested as sufficient compromises in the make-or-buy dichotomy they do not represent novel forms of governance. This is because they are not in accordance with the possibility of divisibility in the full function model and thus are simply adjuncts to it.

This chapter has sought to demonstrate that integrated companies are divisible in two dimensions. The first is the distinction between human and physical assets, as illustrated by the link and scale alliance structures. Scale alliances tend to be secured by physical asset specificity which has long-term applicability, whereas link alliances are generally seen to be subject to *ex post* opportunism and so only last for relatively short-term periods. If the link alliance is made between complete, discrete functions, however, then the advantages of new developments accrue to the partner responsible for the function and so opportunism does not arise. This indicates that VJVs involving

complete and complementary functions may be the basis of long-term sustainable partnerships. The second dimension is the distinction created by factor endowment differentiation between different international regions. This indicates that factor endowment differentiation may be enduring and provide an international division to an alliance. In combination, the IVJV has the potential to competitively replicate the structure and size prescribed by the automobile industry paradigm.

Against the background of the automobile industry paradigm proposed by this thesis, the next chapter will examine the activities and subsequent collapse of the main case study company, MG Rover. In particular, from the perspective of approximating to the automobile industry paradigm, this will focus on the company's attempts to secure its future, ultimately unsuccessful, by way of international joint ventures.

Chapter 7:
A Sustainable Model for MG Rover

This thesis has set out the conditions for an automobile industry paradigm. This defines the theoretical structure for a prototypical automobile manufacturer in terms of scale and vertical integration. These two structuring forces have been assessed in terms of economies of scale and transaction costs, respectively. The resulting model has extended the Budd paradigm to show how an optimal firm would integrate the four main processes (R&D, BIW, powertrain and final assembly) into a full-function structure, each function exploiting the available economies of scale.

Survivor analysis has found that although the industry leading automobile manufacturers benefit from strategic advantages, the MES for the industry is likely to be somewhat lower. A company that is close to the MES for the industry represents the prototypical form of company, and its output is signified by MES_P at around 600,000 units a year. The onus is then on those companies that are sub-optimal to MES_P to formulate a strategic response that enables them to approximate to the advantages of the paradigm. As was examined in Chapter 6, this can be done internally, using the company's own resources, or externally, by accessing those of another company. Internal approximations tend to focus on the utilisation of the physical assets by either stretching the production life of the product or exploiting economies of scope and using flexible manufacturing to intensify the production system. However, neither approach excuses the company from the cost implications related to minimum efficient plant size (MEPS) or overall minimum efficient scale (MES_P).

External approximations to the paradigm do not include transacting with companies in the market since this is diametrically opposed to the full-function feature of the automobile paradigm, not an approximation of it. In order to replicate the full-function structure by using an external mechanism the company must partner itself with another company in a manner that offers an alternative to the make-or-buy dichotomy. Alliances have been put forward as a quasi-internalised organisational

structure and this can involve sharing of facilities in a horizontal joint venture. However, it has been suggested in the previous chapter that joint ventures are most stable when they coincide with the divisible company activities. Since companies are most readily divisible along functionary demarcations this thesis has put forward the concept of the vertical joint venture (VJV). This replicates the full-function model so that partner companies take responsibility for one or more of the complementary functions.

International factor differentiation also encourages divisibility by offering cost advantages when structuring around human and physical assets. Allied to the VJV structure, the resulting international vertical joint venture (IVJV) allows companies to continue to specialise in the human and physical factor endowments of their existing functions to their mutual benefit. If the functions are also competitive in terms of scale then there will be sufficient approximation to the automobile industry paradigm for the combined companies to be competitive.

Thus far this thesis has presented arguments from scholarly sources concerning the structure and governance of automobile companies. At this juncture it is therefore necessary to include primary fieldwork data to directly reveal the views of the interviewees. This will bring a new perspective to the challenges of automobile companies attempting to maximise the opportunities that face them. It will also clarify some of the mechanisms of governance structures, in particular the validity of the M-Form of governance for managing automobile firms.

This chapter has been divided into two sections and Part I will deal with the contextual companies. This will include some information that is also related to MG Rover's predecessors (e.g. BL, Rover Group) since these had organisational structures quite distinct from that of MG Rover and the data might more properly belong to the contextual industry. It should also be noted that since the UK industry used to be dominated by the predecessors of MG Rover, many of the examples given by the contextual industry sources included references to those firms. Part II will then look at the historical antecedents to MG Rover, its five years of operation and then suggest a structure that might have prevented its ultimate demise. Reasons for this proposed

option not proving to be feasible will be discussed and compared to the final, posthumous structure of the company's assets.

Part I: The Contextual Automobile Industry

If a full-function company lacks the scale of output necessary to be competitive with its peers within the automobile industry paradigm, then it can obtain benefits by the use of its existing resources. There are two options for making internal approximations to the paradigm: one is to extend production runs, the other is to intensify the use of production facilities. This section will examine how the companies that make up the contextual industry applied the two approaches.

7.1 Internal approximations to the automobile industry paradigm

Although MES_P represents the minimum sustainable size for an automobile company there are incremental advantages to higher output ranges, mainly due to the diversification of risk. The techniques for intensifying or extending the use of production capacity were therefore of utility to those companies above MES_P to compound their advantage. It was also likely that automobile companies with output below MES_P would try to use the techniques to approximate to the requirements of scale production. For a particular process this meant attempting to approximate to MEPS in the relevant function. Chapter 6 has already cast doubt on the feasibility of this approach by manufacturers (see section 6.2 above), nevertheless the fieldwork sought elite views to provide a more empirical context.

Concerning product life cycle extension, Mr Anthony Millington of ACEA gave as an example the Rover Mini, popular in Japan despite a thirty year production run, but added that Rover Group had regularly refreshed the product with special editions. This was sufficient to keep a highly differentiated model in production but Professor Daniel Jones cautioned that, in general, there is little opportunity to extend production runs because of the capricious influence of fashion:

"Honda sells a hot product, then it goes and they have to find another hot product."

Mr David Blume of Jaguar was more specific:

"If Honda makes an interesting move, Toyota is ready to cover it."

Professor Jones felt that within this strategy it was only by modular design that vehicles could be updated piecemeal, allowing certain parts of the vehicle a longer life-cycle. There was no evidence that this was being enacted upon and, at Honda, Mr Takeshi Sumita added that the company policy now was to change a model in all markets and production sites simultaneously. Honda would not selectively extend production runs according to the market: for the 2002 Accord, only China was slightly behind by three to four months. This clearly revealed a strong centralised governance structure coordinating global production and component supply and simplifying the investment in new technology. Mr Sadanori Ito at METI pointed out that environmental concerns were pushing for greater technical innovation, hybrid engines being an example, and by implication this prevented long production runs. This indicates that extended production runs are the last resort of a firm and more difficult than they were in the past.

Intensification of production based on economies of scope was more fruitful as a device for improving output efficiency of products. Many of the interviewees referenced the Toyota Production System (TPS) as the system for achieving this and Mr Koji Yamada of Toyota clarified that TPS had been a refinement of the mass production system developed by Ford. Mr Daigo Umeki of Toyota explained that just-in-time (JIT) component deliveries are not strictly speaking about having low stocks but minimum stocks, the actual quantity dependent on what the company believes is sufficient. He asserted that TPS is not lean production but production in a "dangerous condition", meaning that a weakness in the system will be exposed by a stoppage and immediately identified. This required careful centralised planning to establish the system for a plant, implying that the opportunity for local operational control was extremely limited.

It is on this basis that TPS is applicable to other production systems with specialist manufacturers organising production on a similar basis. According to Mr Douglas Dickson, Bentley operates a version of TPS, particularly thanks to the role of Mr Dave Hudson, an ex-Toyota production engineer, who designed the Bentley system. Mr Adrian Hallmark described Bentley's flexible production system as being efficient at annual production of 15,000 a year from three shifts and capable of producing three variants of the Continental model. Although the older Arnage model was observed to

have its own, much shorter assembly line this too could cope with variants of the same basic model. Dr Ulrich Eicchorn, chief engineer, described how the Bentley production system is modern in essence, being U-shaped with JIT delivery, but with craft production of certain components, such as leather seats, taking place in sub-assembly stations. Again, the system seemed to be designed to be almost self-supporting, with very little need for operational involvement by divisional managers. Even Morgan's craft style of manufacturing did not preclude the use of a TPS style production flow with *kanban* component supply controls (Mark Aston, 12 July 2002).

Flexible production was a crucial method for maintaining output near to production capacity and products were often designed for flexible production from the outset. Professor Hiromi Shioji described how US manufacturers are able to benefit from greater flexibility in the way that they design their light trucks. Although the separate chassis is usually thought of as being from the craft era of production, it also permits greater flexibility in body shapes than the unitary style favoured by Japanese manufacturers. At Aston Martin, Mr Tim Watson showed an updated version of the approach, the company's production strategy depending on the single aluminium VH vehicle platform which could be adapted to various different models for assembly on one line. Powertrain production could benefit in a similar way, Jaguar's David Blume stating that the Jaguar V6 engine is made in the same factory as that for Lincoln engines, though with a custom configuration, and this allows the factory to operate at a far higher scale of output.

Some respondents reported technical limitations to flexible manufacturing. Mr Daigo Umeki of Toyota said that the main restriction to the number of models that could be made on one line was storage space for the components. Another restriction is powertrain configuration because a large machine is needed to lift and install the powertrain, so to make it available for all types the machine would have to be even bigger. According to Mr Takeshi Sumita, Honda lines are capable of assembling eight different model types, but this is not always necessary and the US Accord line was fully occupied with the one model. There were, though, still advantages to flexible production even then because Mr Chris Rogers added that flexibility also allows faster new model introduction.

The general consensus amongst the contextual sources was that the internal techniques available for approximating to the automobile paradigm mostly amounted to flexible production methods for maximising the available production capacity. This would then allow ranges of products to be fabricated in single plants that were constructed in accordance with MEPS for that function and diversify the risk of fluctuations in demand for particular models. Before investigating how firms might make use of external resources to improve their output relative to MES_P the research looked at the opportunities that would be available in the global industry.

7.2 Structure and opportunities of globalisation – institutions

The research interviews raised the subject of globalisation to uncover the competitive advantages of entering foreign locations. The previous chapter of this thesis has discussed globalisation as the integration of processes between countries, which would then largely eliminate international differentiation. In the first instance, the interviewees were asked to comment on the way that globalisation was regulated to find if factor endowment differentiation could be attributed, in part, to variations in political regimes. Rather than the supra-national institutions of globalisation, like the WTO, World Bank and so on, the comments were concerned almost entirely with the next unit of analysis down, national governments and their agencies. Three main areas emerged from the interviews:

- Mandate of the institution
- Benefit to industry
- Cost to industry

These issues are all considered in this section and the contextual interviews covered a wide range of institutions. Table 7.1 lists the institutions mentioned by the respondents and their mandates to influence the industry along with the resultant costs and benefits.

Table 7.1 Institutions of globalisation – effectiveness

Data Source	Institution	Mandate	Benefits	Costs
Mr M Harbour	WTO US government	Free trade Domestic protection	Single market	Ineffective protection
METI	MITI Chinese government	Domestic promotion Domestic protection	Guidance	Export control Corruption
ACEA	ACEA	European representation	Guidance	
TGWU	National governments Global industry Unions DTI	Domestic protection Job protection Industry guidance	Incentives Maintain national skill base Mediation	Distorts global competition Powerless
Jaguar	Government	Regulations		Development costs
SMMT	SMMT	UK industry representation	Unify UK industry	

There was a marked lack of enthusiasm for the institutions of globalisation, the overall impression being that they are simply part of the environment that companies operate within. The WTO was seen as a promoter of free trade but the emphasis amongst interviewees was on the more variegated influences of national governments. This meant that not only was there little guidance on seeking international differences, such as factor endowments, countries did not seem to promote these differences either. METI and ACEA looked for a positive government influence in the form of guidance for the national industries, and the SMMT liked to think that as a trade body it was an institution that could unify and represent the interests of the UK industry to the domestic government and internationally. The TGWU was more defensive, looking to the UK government as an institution to support domestic industry and maintain the national skill base. From there on, opinions were overwhelmingly negative: domestic protection, where it was effective, was seen to distort the industry and encourage corruption. Since the benefits of factor endowment differentiation are accessed through international trade, the effects of protectionism are seen here to blunt the attractiveness of foreign locations. For example, the view at Jaguar was that government policies tended to result in higher development costs to meet the various

regulations. Where institutions did provide some advantage it was through a supporting role as a guide or skill provider, a factor that Dunning (1979) noted in the ability for a country to improve upon its factor endowments. The TGWU did put forward one way in which factor endowments are temporarily improved, this being the provision of financial incentives for firms to invest in specified locations.

The internalisation of markets within large corporations tended to divert attention away from international differences. Honda showed that large companies have the internal resources to be self-supporting and therefore rarely need to interact with any institutions, global or national. Contrary to critics of globalisation, Honda simply acquiesces rather than confronting the institutional authorities, though its dependence on the US market does have a significant impact on its operations. Table 7.2 illustrates this point.

Table 7.2 Institutions of globalisation – effect on Honda

Data Source	Institution	Mandate	Advantages	Disadvantages
Mr H Yoshino	US government	Market conditions Dealership isochrones		Costs of special models Supplementary dealer network
Mr T Iida	US government	EPA regulations	Raises technical standards	
Mr T Sumita	China government	FDI control		Equity restrictions

Again, it seemed that international differences tended to increase costs rather than offer opportunities to reduce them. The higher costs seemed to be because the automobile industries have economies of scale that favour volume production of standardised products, which then need to be adapted at additional expense for individual markets. They might also incur structural costs in being obliged to adjust their infrastructures. Honda ex-CEO, Mr Hiroyuki Yoshino, noted the increased costs in the US of adapting models for the local market and having to establish two dealer networks due to prescribed catchment areas. Mr Sumita also pointed to the restrictions on investment in China by the government there, foreign direct investment (FDI) being limited to equal joint ventures with local companies. However, such market distortions would apply to all incoming automobile firms. Indeed, Mr Iida felt that the technical requirements introduced by the Environmental Protection Agency (EPA) in

the US had the advantage of raising technical standards which had application elsewhere, Honda being ready to exceed those standards. In sum, Honda did not declare any particular hardship as a result of the existence of global and national institutions.

7.3 Globalisation and the contextual automobile industry

Although political institutions seemed to be attempting to promote globalisation by reducing international differences, for example by handicapping the advantages of foreign investing firms, the interviewees were asked whether they had found differences that could be exploited. The purpose of this was to discover if factor endowment differentiation was still in evidence, as theorised by Schott (2003), or if globalisation meant that international differences had been generally eradicated. It also investigated some of the OLI advantages put forward in the eclectic theory (Dunning, 1981). The following categories of data analysis emerged from the interviews across these two areas of research:

- Level of globalisation achieved
- Drivers of globalisation
- Inhibitors of globalisation

The interviewees were questioned for their thoughts on how international exposure had changed the structure of the automobile industry. Table 7.3 summarises the views of the interviewees as to the different global levels to which the world's automobile industry has been structured, and whether the companies had a global perspective or were domestically orientated.

Table 7.3 Global automobile industry and levels of international integration

Data Source	Level of Analysis	Level of International Integration
Professor H Shioji	Honda strategy GM strategy	Domestic Global
Professor D Jones	GM strategy	Global
MRI	Japanese industry	Domestic
METI	Japanese industry	Domestic
Toyota	Technology Toyota company structure Supply network	Global Domestic Domestic

It can be seen that Professor Shioji divided global strategies into two basic formats, epitomised by Honda and GM. Honda's strategy was centred on Japan and, according to the other respondents, it had this in common with Toyota and the Japanese automotive industry in general. This was, therefore, in agreement with this thesis that such companies operated a U-Form of governance structure. Conversely, Professors Shioji and Jones considered that GM showed a global perspective, perhaps alluding to the M-Form. Toyota's assertion that technology, a generic factor of the automotive industry, is a global resource was notable when the company structure is seen as being domestic. If the technology is equated with physical assets then the company appeared to view them as part of globalisation, retaining its human assets within its home base and implying that this is where its ownership advantages lay. This view finds support in Klein (2000) that control of an organisations assets originates in the ownership of the labour contracts. In this way, the physical assets of production can be globally spread but control of them is retained by having the core human assets under centralised control.

Respondents were asked to comment on the forces behind international structuring and a shortage of human assets seemed to be a common problem and one quoted by several respondents. MRI felt that HR was an inhibitor of international structuring in the case of Japanese manufacturers due to the lack of Japanese managers who could oversee foreign operations. This further emphasises the centralised governance structure of Japanese companies. ACEA also noted a strong social contract among Japanese manufacturers to support the home base, METI adding that this was manifested in an investment policy explicitly centred on Japan. The home base was

also seen as a source of technical innovation by both METI and MRI. This ignored the possibility of technical innovation in other locations, a perverse conclusion given the international evolution of the industry.

Honda was a good example of how companies internationalise their activities only when obliged to do so, as opposed to seeking new opportunities. It appeared that foreign markets were beneficial only in exploiting economies of scale, while design variants and economies of scope were a means to achieve this. Table 7.4 shows how Honda is selectively globalised. There was support for core R&D being conducted in Japan, most crucially Mr Yoshino asserted the location advantage of maintaining 90% Japanese input, but there was overwhelming support for a global application of the company's culture. Local R&D was seen to be part of this but the location advantage for it was minimal, however, and Mr Yutaka Ikeda (28 February 2004) described how even the local R&D was controlled from Japan, the project leader for the Accord US design team spending three years in Japan. The purpose, as Mr Sumita articulated, was to exploit the location advantages of producing as close to the target market as possible with a locally adapted product. Conversely, Mr Iida pointed out that it was possible for production to be shifted around the world to maintain efficient production schedules, but supplying the American market with production from the UK is, of course, the very opposite of producing close to the target market. It would appear that although the location advantages of producing close to the market are present, exploitation of economies of scale is again the primary concern, coordinated through centralised control mechanisms.

Table 7.4 Domestic and global structures of Honda

Data Source	**Integration of Resource**	
	Japan	**Global**
Mr H Yoshino	Core R&D Niche R&D (China)	Company philosophy Regional autonomy Local R&D
Mr T Iida		Company philosophy Local management
Mr T Sumita	Core R&D	Regional autonomy Local R&D Market based production
Prof. T Demizu	Senior management	

Despite Honda's so-called "glocalisation" policy, a globalised corporation with delegated local responsibility, it seemed that the company had retained its unified domestic structure. The global spread was claimed to be about servicing international markets with local production and some ability for locally designed product variants. However, when a plant was installed for a specified output it then became paramount to maintain the output even if it meant serving multiple markets. First amongst all plants would be those established in the home base. Honda representatives stated that the variants in foreign markets were prepared at the local level, although it was clear that Japanese central control remained strong. Including R&D facilities, it would appear that ownership advantages were dominant over location advantages. This was reflected in a governance structure that was more reminiscent of the U-Form than the M-Form.

With markets seen as an opportunity to raise production levels there was a reluctance to adapt products to local market conditions anymore than was necessary. Table 7.5 summarises the degrees to which products are adapted to overseas markets, as reported by the respondents.

Table 7.5 Degrees of product adaptation to overseas markets

Data Source	Unit of Analysis	Strategic Response	
		Adaptation	No Adaptation
Toyota	Ferrari Japan		Rain ingress
Mr M Harbour	Nissan Europe Product brands	 Option packs	No high performance diesel Core brand DNA
SMMT	Jaguar Honda Europe Saab Porsche	 New SUV niche	No diesel No diesel Hatchback only
Mr P Woods	Rover Mini	Japan (coincidental)	
ACEA	European sales in Japan		Profitable niches

At Toyota there was an amusing story about Ferrari's failure to rain-proof their vehicles against Japan's rainy season, illustrating the manner in which Toyotas are more conducive to foreign market adaptation. The easiest method of adaptation is to offer special option packs, first mentioned in interview by Malcolm Harbour and expanded on by Mr Woods. However, when it came to technical changes Mr Harbour

and the SMMT noted that Japanese manufacturers tended to be unwilling to develop diesel engine technology, Honda not releasing its first diesel engine until 2001. Similarly with the body structure constraints set by the Budd Paradigm, there are limits to how far a vehicle can be adapted without incurring expensive product redesigns, SMMT's mention of Saab's hatchback being an example: sales of a saloon variant might not have justified the development costs. This does not mean that new products are not designed for foreign markets but only, as in the example put forward by SMMT of the Porsche Cayenne, if that represents the core market for that product. In such a case, there may be limited adaptation to the company's home market.

At Honda there was a much more conclusive view of global markets: well established international sales volumes meant that there was little in the way of new strategic market challenges. Mr Yoshino was clearly proud of the level of international sales, specifically quoting motorcycle successes. Mr Sumita mentioned that the product needed to be matched to the market and Honda has sufficient economies of scope in the product range for any market to be receptive to at least one model. Professor Demizu mentioned that low price models were produced in Thailand, yet these were models already established in the Honda canon. This could be further supported by the ability to schedule production globally, as Mr Iida boasted, yet again this is not a strategy that can be chosen *a priori*; Honda has established worldwide production and so it can call on it when necessary, but this is not the same as planning worldwide schedules and then installing the plants. It was clear that as Honda grew in size and product range it became increasingly easy for it to enter new markets with the minimum of adaptation.

Overall, the contextual interviews did not reveal a consensus on the opportunities raised by globalisation, and much of the reason for this lies with the companies being industry leaders within the automobile paradigm. All the Japanese manufacturers kept a strong domestic structure from which activities were extended to global locations. This was done strategically based on existing economies of scope in the product range, production methods and management rather than to exploit factor endowment differentials. Where there were cost benefits to new locations, from low labour costs to local government incentives, these were incidental to the overriding strategy of supporting existing production capacity. The degree of product adaptation practised

by the companies was confined by the technical limitations of the Budd paradigm, which restricts the number of variations possible for a given vehicle body structure, but corporate control also held back local autonomy in design. For example, although US manufacturers use a separate chassis as the basis for their SUVs, and thus enjoyed greater design flexibility, almost none of the Japanese vehicles in the US have used the same system. Japanese manufacturers, therefore, remain relatively weak in SUV sales while US manufacturers can offer the market product diversity.

Internal approximations to the automobile paradigm were generally viewed in terms of maximising the use of existing production facilities and this was supportive of the precepts of the automobile industry paradigm. Industry leaders received incremental benefits from such approximations since it diversified risk so there was no motivation for fundamental restructuring. External approximations, in the form of inter-company collaboration, were next examined for evidence of restructuring that could provide more than just incremental advantages.

7.4 Collaboration

If the automobile industry paradigm defines the lower limit of sustainable production (MES_P) then it behoves the sub-optimal automobile company to find some structure that replicates the cost advantages of the paradigm. Internal methods such as product life extensions and flexible manufacturing help to maintain production levels but do not correct for uncompetitive scale. External methods involve some kind of partnership with another company in order to share resources, although a partnership can take various forms. Grossman and Hart (1986) define a firm as having control of its assets, but not necessarily ownership. This being the case, for the purposes of comparison, the relationship between parent and subsidiary can be viewed as being equivalent to a partnership between independent firms.

This is not merely a research device; companies like Bentley, Aston Martin and Jaguar have to make business cases for funding as much as any independent company, even if the source of that funding is within the parent group. While this semi-

autonomy should not be confused with alliances between full independents it is instructive on the nature of collaboration.

Two themes emerged from the collected interview data:

- Evaluation of potential partners
- Nature of joint ventures

Chapter 6 discussed how the divisional companies such as Jaguar and Bentley seemed to hold a semi-autonomous status within their parent groups, with a certain amount of *ad hoc* involvement on both operational and strategic matters by the parent companies. Platform sharing might be expected to have long-term strategic importance due to its similarity to scale alliance concept of Dussauge *et al.* (2004). However, these relationships were often short-lived, sustaining the recipient until it could develop its own platform design. This was also the case for link alliances between independent firms, where Mr Yamaguchi saw frequent culture clashes. Numerous examples are available in the literature. BMW tried a joint venture in engines with Chrysler, but this lasted only from 2000 to 2006 (Just-Auto, 2007).

Apart from the exception of the relationship with Rover Group, joint ventures at Honda did not involve equity holdings. These joint ventures were generally short-term and compensated for a temporary weakness, a feature of link alliances. Table 7.6 sets out how the participants at Honda viewed the role of joint ventures at the firm, the impact of the Honda-Rover Group joint venture on MG Rover being further considered in Part II of this chapter.

Table 7.6 Honda – Impact of joint ventures

Data Source	Partnership	Impact	
		Immediate	Continuing
MRI	Peugeot/Rover/Isuzu	Diesel engine	Ended
Mr T Sumita	Rover	Introduction to Europe Helped Rover Joint products	Life cycle problems
Mr K Watanabe	Rover	Coordination difficulties Establish common ground	
Mr C Rogers	BMW – Rover	Wrecked progress with Honda	Prevented Rover sustainability
Mr H Yoshino	Honda – any partner		"Three legged race"

With diesel engines Honda seems to have gone through at least three different partnerships before developing its own units. This supports Dussauge *et al.*'s assertion that link alliances are short-lived. The point is further emphasised by the joint venture with Ballard to research fuel cell technology, Honda leaving the alliance when it had learnt enough to conduct its own research. Most stark of all is Mr Yoshino's assertion that a joint venture is like running a "three legged race", and Mr Kunihasa Watanabe lists some of the coordination difficulties with Rover Group. Although Mr Watanabe stated that these problems were solved with time, Mr Sumita commented that over the long-term there were problems in having model life cycles that were not synchronised. Despite this, Mr Sumita felt that Honda had gained from Rover Group in easing access to the European market, just as his colleague Mr Chris Rogers believed that Honda was a stable partner for Rover Group.

In the course of the interviews there was a high degree of support for the theories of Dussauge *et al.* (2004). Link alliances were expedient in the case of platform sharing within Ford's PAG, while Honda went through a series of link alliances while seeking to enhance and subsequently protect its R&D. For scale alliances the interviews revealed more longevity, Toyota's joint venture with GM at NUMMI being the classic example. The common feature of link and scale alliances amongst car manufacturers, that are industry leaders within the automobile paradigm, is that the allinaces support existing activities. In this sense they can be seen as bringing incremental improvement to the competitive position. Like the internal

approximations to the automobile industry paradigm, external approximations are not, therefore, achieved through novel restructuring but adaptation of the existing structure.

7.5 Conclusion – adaptation to the automobile industry paradigm by contextual companies

Production extensions were unanimously rejected by the interviewees representing the contextual automobile industry. Global markets mean that the older products would be in direct competition with both the replacement model and the latest generation from another manufacturer. This may change in the future as manufacturers find that retaining product platforms can enhance economies of scope, particularly with regard to launching low cost models such as the Renault Logan. In more general terms, production extension was only applicable at the functional level with a marked tendency amongst the Japanese companies to retain use of existing facilities in the home market. Production intensification in the form of flexibility, however, was widely installed, even where it was only to facilitate faster new model changeovers. This greatly facilitated production scheduling and reduced the risk of variation in production output. It did not, though, represent a restructuring but an adaptation of existing facilities to maintain production capacity utilisation.

Similarly, the contextual companies, all of them multinational enterprises (MNEs) or their divisional companies, used the apparent advantages of globalisation to support their established structures rather than to restructure. In terms of the OLI model, the advantages seemed to be on the ownership side with companies extending their existing structures into new regions rather than undergoing fundamental restructuring themselves. Locational advantages were therefore due to the size and structure of the market rather than its inherent quality as a production site. There also appeared to be internalisation advantages which inhibited the formation of partnerships, most notably with link alliances where *ex post* opportunities would tend to accrue to one partner over the other. Scale alliances showed greater longevity, as predicted by Dussauge *et al.* (2004), but they did not lead to expansion of the alliance to other facilities. The contextual sources provided a great deal of data showing that although a desire to

suppress costs was a major driver of international growth, this was countered by a strategic desire to defend ownership advantages and maintain the integrity of the domestic operations. This strategy was then managed by a centralised governance structure.

The presence of international factor endowment differentiation did not result in a systematic strategic response. Many respondents noted that the ability to serve global markets is complicated by local differences, either due to the policies of the authorities or the market. There were many instances of companies failing to offer appropriate products, particularly diesel engine derivatives. In Japan it was noted that European manufacturers preferred to occupy profitable niches with low volumes of products barely differentiated from the European versions. It was often stated that some locations offered lower cost production, yet global production schedules could override them.

For those companies that were industry leaders within the automobile industry paradigm the main concern seemed to be with maintaining the *status quo* of the company within its industrial environment. As such, the internationalisation strategy seemed to be targeting at reducing risk, particularly in production variation. Since MG Rover was sub-optimal within the paradigm, nor had a larger parent that was, it was examined as a case study to see if it could throw light on the potential ways in which an uncompetitive, full-function car producer might overcome its cost disadvantage. The empirical data for this will be examined in Part II of this chapter.

Part II: MG Rover

7.6 The rise and fall of British Leyland/Rover Group

This section of the thesis will present the historical antecedents to the independence of MG Rover in 2000. This commences with a brief history of the two brands, MG and Rover, describing how they came together. The section will then establish the roots of the problems facing British Leyland (BL), and then Rover, in particular their failure to restructure, leading to a vicious cycle of lack of funds preventing new product development and thence further declining revenues. BL first attempted to counter this by improving its internal capabilities with injections of government funding. When this proved insufficient, it then turned to external assistance in the form of a joint venture with Honda, followed by ownership and funding by BMW.

7.6.1 The consolidation of MG and Rover

The MG Rover brand was comprised of two marques, MG and Rover, plus a variety of moribund brands. MG was founded sometime in the early 1920s under the guidance of Cecil Kimber, the exact date being unknown. It was owned by William Morris as part of his Morris Garages business until it was merged into the Morris Motors car manufacturing business in 1935. Morris Motors, as part of the Nuffield Organisation (including Wolseley and Riley), then went through a series of mergers itself:

- 1952 merger with Austin to form the British Motor Corporation (BMC)
- 1966 BMC merged with Pressed Steel and Jaguar to form British Motor Holdings (BMH)
- 1968 BMH merged with Leyland to form British Leyland Motor Corporation (BLMC)
- 1975 British government took a majority equity holding in BLMC and effectively nationalised the company.

Throughout this period the bloodline of the MG marque became increasingly diluted. The marque has always been a 'badge engineering' marketing tool of its parent and has never had its own dedicated R&D or powertrain operations. It did have its own factory though, at Abingdon, from 1929 to 1980. After the factory closed the nadir was purportedly reached when the MG brand was attached to the poorly received Metro, Maestro and Montego variants (Williams *et al.* 1987; Sharratt, 2000). MG regained its credibility in 1998 with the release of the MG-F sports car, and still more from 2000 under MG Rover when attachment of the badge to sportier versions of Rover models was greeted more positively than previous 'badge engineering' strategies.

Rover has an altogether weightier presence within the history of the British automotive industry, as documented by Graham Robson (1988). James Starley and Josiah Turner began The Coventry Sewing Machine Company in 1861 but the latest innovation in personal transport, the bicycle, prompted a change in direction in 1869. Starley then left to start his own company with cyclist William Sutton, using the name Rover, and producing the first safety bicycle in 1885. The company moved progressively into car manufacturing during the early years of the twentieth century and concentrated solely on cars from 1924. With the arrival of the Wilkes brothers in 1929 the products gained a reputation for solid reliability. However, the company also showed moments of innovation, such as the Land Rover off-road vehicle in 1947, the initial designs of which were based unofficially on the Willys Jeep, and the first gas turbine road car, JET 1, in 1950.

Like MG, the Rover marque was subsumed into successive mergers:

- 1967 merged with Leyland Motor Corporation
- 1968 Leyland merged with BMH to form British Leyland Motor Corporation (BLMC, renamed BL from 1977).
- 1976 Rover SD1 established internal merger between Rover and Triumph.

After the launch of the SD1, the Rover brand became part of British Leyland's marketing strategy, being applied to a variety of models, some of which had not

started out as Rovers. By 1986 the Rover brand was chosen for the car-making group, changing from BL to Rover Group at the same time as Land Rover was spun off as an autonomous business unit.

7.6.2 Internal rescue strategies – 1975 to 1978

In 1975, BLMC had come to dominate the domestic automotive industry in terms of output but it lacked internal resources to fund the replacement of ageing and unprofitable product lines while still consolidating its operations after decades of mergers (Pilkington, 1999). The combined operation comprised almost every aspect of the automotive industry in the UK, from trucks and buses to cars, but without restructuring it was simply the same set of companies under a single corporate banner. In the words of Michael Edwardes, chairman of BL 1977-1982:

"BL represents a microcosm of the issues affecting the British industry as a whole." (Edwardes, 1983, p.9.)

It was not a single full-function firm exploiting available economies of scale, as prescribed by the automobile industry paradigm, but an affiliation of small full-function firms, all of them suffering the same scale disadvantages they had before the mergers. In the mid 1970s, BLMC was comprised of eight companies and fifty marques. Manufacturing capabilities included Longbridge (Austin) and Cowley (Morris) plant complexes, plus another seven final assembly plants handling production for Jaguar, Rover and Triumph. Each of these plants had remained attached to its historical brands, creating inflexibility in production (Bhaskar, 1979). When flexible production was introduced in the 1980s with more automated manufacturing systems the low level of sales simply exacerbated the problem of low capacity utilisation with the burden of the higher fixed costs of the new capital investment (Williams *et al.*, 1994).

The merger that created BLMC had not come about through commercial necessity but political motivation, a government creation pushed through by Anthony Wedgewood Benn via the mechanism of the Industrial Reorganisation Corporation in 1968 (Church, 1994). The government had been concerned about the inroads being made

by US manufacturers, such as Chrysler's purchase of Rootes, and the national balance of payments. As the elements of the company were brought together it became apparent that there were not the managerial resources to cope with the new structure (Bhaskar, 1979). The inclusion of the Leyland truck company was intended by the government to improve financial controls in the car manufacturing division. Pricing of cars at BMH, for example, was made without reference to the innovations on which the competitive advantage was founded: Ford calculated that the technically advanced Mini, then priced at £496, lost £30 on each one sold (Church, 1994). Investment funds for the future were further dissipated by the company policy of continuing to pay dividends, even until 1975.

Some fault was found with the technicalities of production, Lewchuck (1987) criticising the company for failing to adopt the Ford style of mass-production while retaining old systems of payment and control. This view does not find favour with Williams *et al.* (1994, p.137), pointing out that production engineer Frank Woollard had a good understanding of the need for Automatic Transfer Machines (ATM) and used pre-cellular flow in a pull-through production style reminiscent of Toyota's TPS production system. This resulted in car assembly at Longbridge CAB1 (car assembly building 1) of 12.5 finished cars per worker. However, while Woollard understood the global innovations in production, output capacity did not find support in sales as it had at Toyota. Foreign opportunities were reduced by the effects of national protectionism, the company having little presence within the EEC while the home market was maturing. In 1975 imports took 33% of the UK market, overtaking BL on 31% for the first time, and the situation was exacerbated by the growing influence of North Sea oil revenues on the strength of the British currency. A crucial factor at this time would have been effective cost recovery to fund future investment, but instead £103 was being lost per vehicle in 1975, deepening to £662 by 1980 (Williams *et al.*, 1994). The company produced 1.26m vehicles in 1975, down from 1.7m in 1973 and lost £76m (Church, 1994).

Government intervention continued throughout the 1970s. Three reports were published during 1974-75: the Ryder Committee, the Trade and Industry Sub-Committee and the Central Policy Review Staff. Most prominent was the 1975 Ryder Report, stating that the company suffered from outdated facilities, a weak

organisational structure and poor planning in consolidating its disparate operations (Álvarez Gil and González de la Fé, 1999). The report was devised under the chairmanship of Don Ryder of the publishers Reed International (Williams *et al.*, 1994, p.151). Emphasis was placed on economies of scale with the stated intention being to expand output to fill available capacity, rather than rationalising the internal capabilities of the company. Bhaskar (1979) noted that BL was in short supply of engineers of all types, quantifying this deficit in thousands rather than hundreds. The Ryder Report suggested consolidating group R&D at one location, but this was resisted by Jaguar which attempted to protect its independent spirit.

The production funding entailed an investment of £2bn in new models and capital equipment with a planned rise in production from 605,000 in 1975 to 961,000 by 1985, closer to the theoretical production capacity limit of 1.2m (Williams *et al.*, 1987). The Ryder Plan was criticised for being expansionist without addressing internal problems of a complex corporate structure, inadequate technical resources and poor industrial relations (IR) of the company, which lost it 252,000 units in 1977 alone (MIRU, 1988). The rise in production capacity might have been appropriate if the mass market had not shifted in favour of the business user, company cars having become established as an employment incentive during a period of pay restraint. Ford had come to dominate the business market since the 1960s, taking 40% of the segment by 1975 (Church, 1994). BL traded on its product innovation which appealed to the private purchaser, but just as this segment was shrinking the sales were squeezed further by the rise in popularity of imports (Williams *et al.*, 1987).

Bhaskar (1979) concluded that the Ryder plan had failed partly because it was ambitious beyond the competence of those enacting it, but the most important failing was in linking funding to improvements in IR and output. When stoppages brought down production, the funding that was available was spent on operational needs, instead of investment. From 1975 to 1977, BL continued to suffer falling production and market share, the car division alone dropping market share from 32% in 1975 to 24% in 1977 (MIRU, 1988). In 1977, Michael Edwardes was brought in from the National Enterprise Board (NEB) having turned round the battery maker, Chloride. Internal restructuring in 1978 meant that BL was reorganised with the cars division being divided into Austin-Morris and Jaguar-Rover-Triumph and each accorded

decentralised decision making. The Corporate Recovery Programme was presented to the government in July 1979 with support from the workers. It was based on a reduction in production capacity, from the 1.2m theoretical limit to a planned 750,000 units a year, and a reassertion of the management's right to manage the firm. Michael Edwardes publicly stated that this strategy was:

"...shrinking the business to a level beyond which we believed it was not safe to go" (Williams *et al.*, 1987, p.95).

Plants, such as Speke, were closed and car production was concentrated on plants at Cowley and Longbridge. Government funding was not contingent on results and was made available for investment in future programmes. However, the company found that redundancies still lagged behind falling sales. Sales had halved to 315,000 between 1972 and 1980 but the work force only halved to 55,000 in the period 1979 to 1983 (Williams *et al.*, 1994). Moreover, the company continued to be dogged by poor economic conditions compounded by a lack of new models. With the company's internal capabilities still uncompetitive, Michael Edwardes decided that the salvation of BL cars lay externally, and so the search began for a joint venture (JV).

7.6.3 External rescue strategy – link and scale alliances

Michael Edwardes stated that the partner had to be in a position of commercial coincidence: similar but complementary needs and aspirations within the same segments as BL (Edwardes, 1983). The purpose of the JV was to improve BL's internal difficulties with new product development, the intention being to return the company to health as an independent and competitive automobile manufacturer. In the terms of this research the need was for a JV which would return BL to a competitive status within the automobile industry paradigm.

The fear was that the company would lose its full-function status and become an assembler of vehicles, thus losing the political support that sustained it. Potential problems were identified as cultural prejudice against foreigners, language barriers, geographical distance and an insecure future for the company if the partner firm dominated. Renault was looked at in 1978 and then rejected on fears that being larger

and state-owned it had the resources to ultimately overwhelm BL. In the same year, Bob Price, managing director of Vauxhall, proposed that he could solve BL's problems by his company providing the mid-range replacement for the Marina, Maxi, Princess and Allegro and receiving in return the small car design that Vauxhall lacked. However, the Gemini project being offered by Vauxhall was then cancelled by its owners, GM (Edwardes, 1983).

A proposal by Edwardes, codenamed "Dovetail", to solve the problem of poor R&D engineering resources at BL was to merge with Chrysler UK, close two of the Chrysler plants and absorb its R&D facilities. It should be noted that it was the inability of the government to let Chrysler UK fail that had undermined attempts by BL to achieve market growth (Church, 1994), the British government having a policy of supporting the subsidiaries of US firms as if they were indigenous even though they operated without reference to the United Kingdom:

"Their corporate strategies are international, their links are within the group rather than within the country, the major decision loci are abroad, they can survive without Britain." (Wilks, 1990, p.175.)

Edwardes seemed to implicitly recognise that developing a link alliance in R&D would not have been stable and so a complete merger with Chrysler's R&D was the preferred option. The deal would have secured access to new engineering capability and one dedicated to new BL models, rather than one distracted by its own model range; this had been the very problem that had dogged the mergers that comprised BL and its antecedents. However, the merger was overtaken by the purchase of Chrysler UK by the Peugeot in 1978. Other plans were to offload Leyland trucks onto Fiat/Iveco, yet another to have John Delorean take control of Range Rover sales in the US, but none of these came to fruition (Edwardes, 1983).

In 1978, ex-ambassador to Japan, Sir Fred Warner, met Honda President Kiyoshi Kawashima. At that time, although the two companies were superficially competitive within the automobile industry paradigm, the two had distinct differences. BL was still handicapped by its multi-company heritage of 16 model families, 30 factories, 8 final assembly plants and had come under state control. Honda was a tightly

structured private company with 2 model families and 2 assembly plants (see Table 7.7). There was little commonality in engine technology, Honda having promoted the CVCC (Compound Vortex Controlled Combustion) technology while BL had inherited whole families of power units. However, there were also the commercial coincidences that Edwardes was seeking. Production levels were broadly similar, British Leyland producing 800,000 cars and trucks to Honda's 740,000 (Mair, 1994), figures that include SUVs, and they both specialised in front-wheel drive technology on cars in comparable market segments. This suggested that the JV would be complementary in engine technology, where BL could gain from Honda, but with commercial coincidence in the basic vehicle configuration which would permit the companies to share in vehicle development. With equivalent levels of output, and Honda having no government funding to draw on, there would be little danger of the Japanese company absorbing BL.

Table 7.7 Honda and BL comparison

Organisation facet	**Honda**	**BL**
Models	2	16
Plants	2	30
Engineering strength	Powertrain	Interior design, suspension, packaging
Model strength	Small cars	Executive cars
Other capabilities	Motorcycles	Trucks, buses
Management culture	Engineering	Bureaucratic

Source: Pilkington 1996

The two companies also complemented each other in the US market, Honda being present with a small car and BL having the large Jaguar sedan. Initially, though, the first priority of the British company was to find a stop-gap product to keep the production lines running between the launch of the Metro supermini in 1981 and the medium-size Maestro in 1983. In 1979, the "Co-operation for business" deal was signed at the same time as the Corporate Recovery Programme reduced British Leyland to 13 factories of all types and shed 25,000 jobs. The Metro began the "product led recovery" in 1981 and in 1982 the Honda Ballade emerged from Longbridge as the Triumph Acclaim, built up from complete knock-down (CKD) kits.

While it was not the first relationship between Japanese and British manufacturers (Nissan had built Austins under licence in the 1930s and 1950s) it was, perhaps, the moment the Japanese industry came of age. It signalled the swansong of Triumph and the arrival of the Japanese as potential saviours of the British car industry.

Honda was still a relatively new car manufacturer in 1978. It had begun manufacturing cars in 1962 with the S360 sports car, but did not break into the mass market until 1969 when the Civic was designed for the US market. This was crucial to the future growth of the company:

"We all believed that if the project failed Honda would have to give up its plan of becoming a full-fledged carmaker." (Hiroshi Kazawa, engineer, Honda, 1999, p.109.)

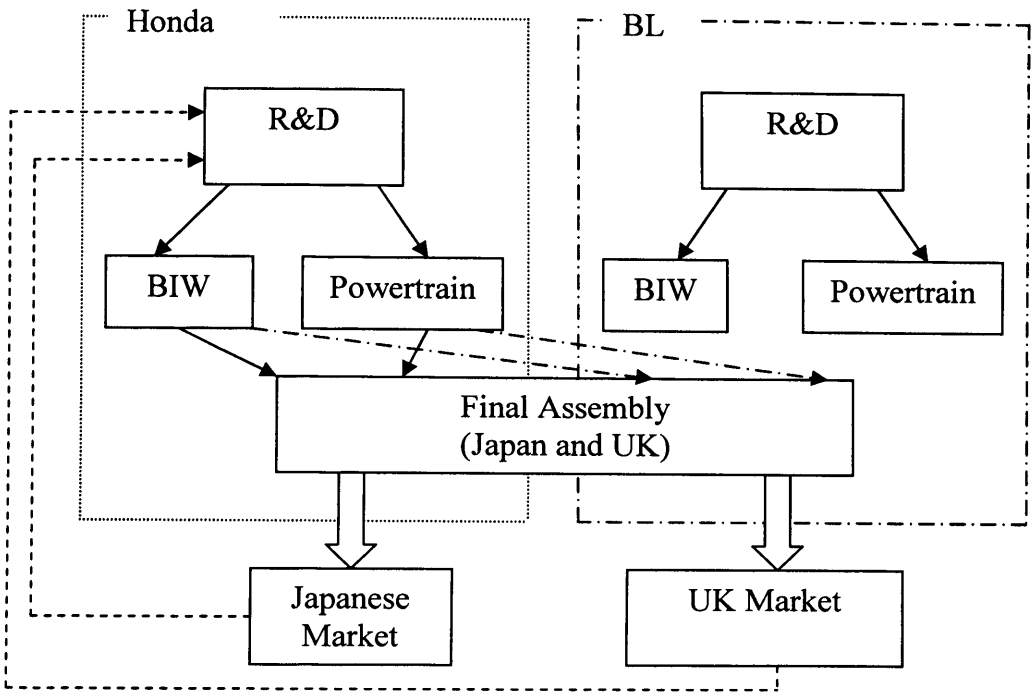
The larger Accord built on the early sales penetration of the US market by the Civic and eventually went on to become one of the biggest selling passenger cars in the market. The company was also experienced in foreign production, particularly in motorcycles where it had been manufacturing in Belgium since 1963 (Honda, 2006). However, in Europe the company had no automobile production and little sales exposure, though the products were conceptually similar to European models (Mair, 1994). Honda was therefore looking for two benefits from a relationship with BL:

1. Market penetration
2. Production facility

Categorising the relationship according to the typology of Dussauge *et al.* (2004), from Honda's point of view it was predominantly a scale alliance, offering the company access to BL's final assembly facility. In the process, it could gain market knowledge and build contacts with European suppliers, though this could be achieved independently of BL. Figure 7.1 shows how the JV for the Triumph Acclaim brought together the assembly functions of the two companies' structures. Since the relationship involved assembly from Honda supplied CKD kits, Figure 7.1 demonstrates that BL's capabilities in BIW, R&D and powertrain were largely irrelevant, although they were being employed elsewhere within BL. Furthermore, the

market intelligence from the UK operation related to this model accrued mostly to the benefit of Honda in Japan.

Figure 7.1 Honda and BL joint venture 1981 – Triumph Acclaim



For BL, Figure 7.1 shows that the relationship was a scale alliance in final assembly, allowing the company to continue operating an existing assembly facility until the new models came on stream from 1983 with the Maestro and then the Montego. Pilkington (1999) found little of financial or technical benefit to BL in the first stage of the relationship, its other functions being effectively isolated, but at least it improved the company's reputation in the market. Pilkington also states that it was from this point that BL recognised the potential for a link alliance, learning from Honda in order to improve BL's own R&D capability. However, Pilkington did not find any evidence that sufficient knowledge was transferred during the period of the Triumph Acclaim project.

The link alliance aspect of the relationship seems to have developed in the volatile manner that Dussauge *et al.* describe. Pilkington (1999) describes five major

programmes and the degree of input by BL (see Table 7.8). The first, the Triumph Acclaim, was a lightly reworked Honda Ballade but it created the cooperative environment for a little more input, the Rover 200 of 1984 offering one BL powertrain system.

Table 7.8 Honda-Rover alliance – BL/Rover share of vehicle programmes

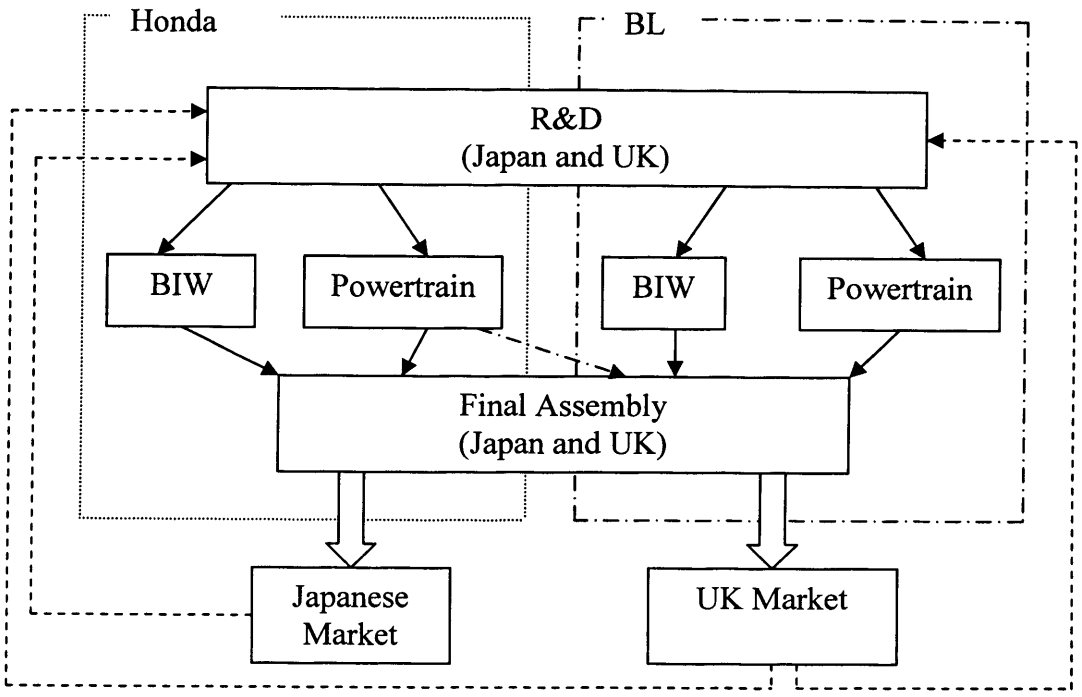
Model	Year of Release	BL/Rover share	
		R&D	Production
Triumph Acclaim	1981	Cosmetic	Final assembly
Rover 200	1984	Cosmetic, one powertrain	Final assembly
Rover 800	1987	30% of design, one powertrain	BIW, final assembly
Rover 200/400	1990	40% of design, two powertrains	BIW, final assembly
Rover 600	1994	Cosmetic, one powertrain	BIW, final assembly

Source: Pilkington, 1999

The Rover 200 was still heavily based on an existing Honda, the new Ballade, but its release in 1984 was actually preceded by the start of a link alliance between the two companies. In 1981, Project XX was announced, a new departure for both companies since it was the first large car for Honda and the first front-wheel drive large car for BL. By agreeing on common design references (or "hard points") the two firms could offer their own styling and powertrain variants. The final Honda product, the Legend, hid any British influence very comprehensively and no British engines were offered. This revealed Honda to be the dominant partner, as noted by Pilkington (1999). Indeed, the Japanese seemed to specify the design to the degree that the only large engine that would fit the range was the Honda V6. However, the Rover 800 range was considerably more expansive, having four-cylinder British engines and a hatchback version in addition to the luxury saloon with the Honda engine.

Figure 7.2 shows the state of the alliance between BL and Honda during Project XX, with a link alliance in R&D and scale alliances in final assembly (both brands being assembled in both countries) but with only Honda providing engines to both versions. It also shows that Honda continued to benefit in the form of market intelligence from production exposure to the UK market.

Figure 7.2 Honda and BL link and scale alliance 1987 – Project XX



The independence of the two companies on final execution of the vehicles was underlined when Honda were able to unveil their version of Project XX in October 1985, a full nine months before BL showed theirs (Robson, 1988). From the disjointed chronology it seems clear that Honda gained early from the link alliance and was then able to pursue its own model agenda. In the sense of being able to get to the market sooner the advantages accrued asymmetrically to Honda. However, despite the cost savings in sharing the design stage it was still a prolonged gestation period, the later commencing Accord, a wholly Honda design, reaching the market before the alliance generated Legend (MIRU, 1988). There were also plans for joint manufacture but Honda was reluctant to subject itself to BL`s quality control, a policy vindicated

in the statement by Williams *et al.* (1994) that even in 1991 the Rover 800 was averaging £325 of warranty work per vehicle, four times that of the Legend.

In addition to forming a link alliance in R&D, BL needed to reform its structure and its IR policies (Pilkington, 1999). With Honda's skills in manufacturing it might be assumed that this would have been achieved through use of the Japanese production technology, but in fact only 10-15% of BL's subsequent improvement in productivity was due to technological innovation (Scarborough and Terry, 1996). Mair (1994) even asserts that Nissan was more influential because it set the industry standard, though BL would later gain more by easy access to Honda's experience starting the Ohio plant, rather than by Honda directly instructing BL in the UK. At the time of the commencement of the alliance the reputation of Japanese manufacturing was low, the Japanese advantages believed to be derived from the factor differentiation of low-cost labour, exploitation of suppliers and copying of Western technology. Initially there was organisational resistance within BL to learning from Honda and British visitors to Japan were only learning by observation, the language barrier making the culture impenetrable to them. The Honda experience in Ohio should have been an invaluable opportunity for BL, but it was not until 1991 that the British started their first formal studies of the Honda culture. As described by a BL manufacturing manager:

"We had our share of problems with Honda to start with. Then, after a while, it all sank in. Why all the aggravation? They're right, we're wrong. All of a sudden the concept changes, and things fall into place" (quoted in Mair, 1994, p.273).

BL did not adopt Honda's method of production in batches, a US market orientated build-to-stock system requiring extended planning (Pilkington, 1999). Rather, BL had its own Minimum Inventory Control/Strategy (MIC/MIS) system using a version of JIT but with large central warehouses and a version of *kanban* which was, though, not as flexible (Pilkington, 1996; MIRU, 1988). Furthermore, the production system was purchased from Honda and thus did nothing to improve BL's production engineering capability. Although the joint venture was intended to be a link alliance, transferring knowledge to BL, by accepting Honda's control over product and production engineering BL's own capabilities were being emaciated:

"It is all too clear that this attraction [to accept Honda systems] diverted the firm away from implementing a learning-based strategy." (Pilkington, 1999, p.467)

BL was in a position, though, to use the period of stability provided by the alliance to conduct some reorganisation. It was also fortunate that the fundamentally perilous state of the company had created an understanding by the unions of the need for reorganisation. The company asserted the right to manage which found expression in the direct communication with the labour force, often from Michael Edwardes himself. This marginalised the unions, but also built trust and co-operation with the workforce based on the particular circumstances of the company at that time. It was not, therefore, something that could simply have been imported from Honda. Indeed, as Mair (1994) stated, BL was learning from Nissan as much as Honda. The reorganisation of IR was started before the relationship with Honda was promulgated, commencing with the teamwork system for the all-British Metro, although Smith (1991) claims that this was a case of workers coping and looking out for each other. In 1987 a TQ (total quality) initiative was introduced and further refined for "Rover Tomorrow – The New Deal" in 1991, and this was formulated by senior management, being only indirectly influenced by experience with Honda (Scarborough and Terry, 1996). This recognised the poor existing economies of scope in management:

"The 'enemy' isn't the Japanese or the Germans; it is the limitations of our managerial 'culture'." (Pascale and Athos, 1986, p.201)

From 1982 BL looked to capitalise on the gains made from the link alliance with Honda by restructuring the company under Sir Austin Bide into the Cars Group and Land Rover-Leyland Group. Jaguar was privatised in 1984 and in 1986 an attempt was made to sell BL to Ford, but this was considered politically unacceptable in the wake of the fallout from the scandals involving Westland Helicopters. In the same year a record loss of £539.2m was announced and BL was renamed Rover Group when Graham Day was installed as the new chairman. In 1987 the group was further broken up with the privatisation of Unipart, Leyland and Freight Rover. Recognising that the remaining car company, Rover Group, was still not ready for independence, Day called for recovery in three phases, involving restructuring, then restoration of Rover Group to commercial viability and finally privatisation (MIRU, 1988).

However, the four alternative recovery strategies that were under consideration seemed to implicitly recognise that the company could not make a case for independence as a mass market manufacturer. The four options were as follows:

1. Selling Rover to another manufacturer.
2. Selling the group to Honda.
3. A move to low volume specialist production with premium pricing.
4. Sale of the group to a non-automotive manufacturer.

Since the first three options imply that Rover Group needed a partner within the industry, the fourth option would appear to have had little logic. Although this was indeed the option that came to pass, it was only effected with the cooperation of Honda.

7.6.4 BAe purchases Rover Group

British Aerospace (BAe) first showed an interest in purchasing Land Rover in November 1987 to provide an add-on to sales of military aircraft. Instead, in 1988, Rover Group in its entirety was sold to BAe for £150m with £520m in government aid and tax allowances (Church, 1994; MIRU, 1988). The automobile alliance was secured by equity cross holdings, Honda taking a 20 per cent share in Rover Group while Rover Group took a 20 per cent share in Honda UK Manufacturing (HUM) in 1989 (Mair, 1994). This indicated that despite the fluctuations in the degree of collaboration for successive projects, Honda was prepared to take a long-term view of the joint venture.

This politically acceptable solution provided long-term stability for Rover with minimal disruption to suppliers and Honda. It was mooted that the two British companies would be able to use a common computer aided design (CAD) system and merge administrative operations in order to benefit from synergy. As it was, the relationship with Honda had been continuing with the release of the Rover 200/Honda Ballade in 1984 providing valuable assembly work for Rover. The Ballades made by Rover numbered only 30-50,000 per year, but this was a significant utilisation of production capacity and with 50% of the value-added being British it made a further

contribution to the domestic industry as a whole (Williams *et al.*, 1987). This scale aspect of the alliance lasted for the duration of the model (Pilkington, 1999). However, Rover was still unable to extend the link aspect of the relationship into making an entrance into the US market under Honda guidance, a move that was further undermined by Day's insistence on withdrawing from markets that did not provide acceptable financial returns. The company was caught in a vicious cycle of not investing in markets where there were poor sales, and the lack of investment then leading to a further deterioration in market share. Despite the scale alliance aspect of the relationship with Honda, the continuing lack of export sales meant that the three assembly plants in the UK were not being fully utilised (see Table 7.9).

Table 7.9 Rover plant utilisation – 1987

Plant	Capacity	Output
Longbridge	400,000	279,000
Cowley South	250,000	132,000
Cowley North	130,000	58,000

Source: Williams et al., 1987

Throughout the period under BAe ownership Rover Group benefited very little from its parent. Financial stability allowed the alliance with Honda to progress but then Rover Group had to forgo its involvement in successive projects when a lack of funds forced it to instead extend production of existing models, albeit with refreshed styling. Indeed, Rover Group was at the mercy of BAe's financial status and the economic recession during the ownership period (1988-1994) reduced the funding available to the car operation (Pilkington, 1999). By this stage in the link alliance Honda had learned as much as it required from Rover Group about UK production and had expanded its assembly plant in Swindon. Rover Group, however, had been frustrated in its requirement for knowledge transfer from Honda. Each of the five projects shown in Table 7.13 had been to Honda's specification, leaving Rover Group to make adaptations. The pinnacle of the relationship was Project XX, but Rover Group lacked the funds to join Honda in its replacement in 1991 and so was forced to extend production of the Rover 800 version, an unsatisfactory strategy in a globalised industry (see section 6.2.1 above). The final joint project, resulting in the Rover 600,

had very little Rover involvement and the company was even reduced to seeking assistance from external agencies in adapting its production facilities to the new model (Pilkington, 1999).

However, although Rover Group was not gaining as much from direct involvement with Honda as critics suggested it should, it was an opportunity to concentrate what resources it had on its own projects. The company designed and installed its new range of petrol engines, the award winning K Series, comprising the full range of small in-line fours to larger V6 engines, available from 1988. The company had also retained its ability to conduct new model programmes by itself, fundamentally re-engineering the Metro into the Rover 100 and delivering on the Land Rover Discovery and Freelander (Pilkington, 1999). The Freelander was an entirely new venture for the company, combining the rugged capability of Land Rover with the Budd Paradigm BIW production techniques of the passenger car division. The vehicle also, therefore, proved that Rover was still capable of production engineering. As Álvarez Gil and González de la Fé (1999, p.395) stated concerning Rover's R&D capability during the period:

"It has maintained the core skills needed to develop new vehicles, like the Rover 100, but it does not have the financial resources to maintain vehicle development across the full range."

The situation in 1994 was that Rover Group had consolidated around three assembly plants (see Table 7.14), had its own powertrain and BIW facilities, as well as a capable R&D operation. It was therefore a full-function company handicapped by poor levels of output which reduced its ability to make funds available for investment. Having already exhausted its internally generated attempts to reorganise sufficiently during the Ryder plan and Edwardes eras, the company had a continuing need for another external relationship, particularly if this came in the form of funding.

7.6.5 External assistance for internal improvement – BMW

By 1994, from Honda's point of view, the link alliance was reaching maturity (Carr, 1999). The company had its own manufacturing facility at Swindon, producing engines since 1989 and complete automobiles from 1992 (Mair, 1994). The company also handled its own European sales distribution and marketing and had established its regional headquarters in Slough in 1989 (Honda, 2006). Although it was not full-function in the UK, all R&D taking place in Japan, it was able to operate quite independently of Rover. This may have contributed to a sense of detachment from Rover Group, and despite BAe suffering financial problems with its regional aircraft division the decision to sell Rover Group in 1993 appears to have taken Honda by surprise, despite it being a known fact that BAe's agreement with the UK government not to sell Rover Group before 1993 was coming to an end (Parliamentary Report, 2000).

Honda suggested raising its equity share to 47.5% if BAe retained an equal share and Rover Group employees were granted the remaining 5%. According to Brady and Lorenz (2001) this would have valued the company at £650m, so would have required an investment from Honda of around £179m for the 27.5% to add to the 20% it already owned. However, demonstrating that BAe gained little of operational value from Rover Group, the aircraft manufacturer was interested only in a complete sale to raise all available funds. This left two more options: a management buyout (MBO) with Honda retaining the 20% share, or acquisition by another company. Brady and Lorenz discount the MBO option because Rover needed $1bn in working capital, which financiers were not prepared to lend.

The third option might have created a three-way partnership, Honda and another company both supporting Rover Group through a 20:80 equity partnership. According to Brady and Lorenz (2001), Honda was looking to enhance its leadership in joint R&D projects by expanding its managerial influence over Rover Group and protect the flow of royalties paid by Rover Group for Honda designs. This it could not have done if its co-owner was another car maker with operational plans for Rover Group. When BMW was revealed as the interested party it therefore brought Honda's plans for Rover Group to a halt. BAe sold its 80% share in Rover Group to the German

executive car manufacturer for £800m (Parliamentary Research Paper, 2000) and a month later Honda swapped its 20% holding in Rover Group for Rover Group's 20% holding in HUM. All future collaboration between Rover and Honda was abruptly cancelled, though this did not affect existing models which continued in production, two even outliving the period of BMW ownership. In retrospect, Honda seems to have been relieved at extracting itself from the alliance with Rover Group (Economist, 2000).

BMW considered that it lacked sufficient volume and saw the purchase of Rover Group as a route into the mass market without risking the premium image of its own brand. The alternative was to create a new brand of its own but Brady and Lorenz (2001) point out that such a development can be an expensive strategy, quoting a figure of $5bn for Toyota to establish the Lexus brand. For Rover Group, the strategy of protecting the BMW brand by keeping Rover at distance had substantial benefits for its engineering infrastructure:

"This rendered Rover substantial autonomy, but compromised integration and scale economies, and the strategy then depended heavily on some revived basic engineering capability" (Carr, 1999, p.417).

If "integration" is considered to be analogous to a link alliance, then without that close connection or the exploitation of economies of scale either, it is difficult to conceptualise BMW's involvement as little other than a source of investment funds. There was speculation that BMW's main interest had been to use the advantages of ownership to secure access to Land Rover's off-road technology. To a certain extent this seems to have been effective, providing the German company with an opportunity to compare technologies and later BMW off-roaders featuring the same type of 'hill descent' mechanism as Land Rover. However, it is not clear to what degree this was a Land Rover development, and it is even available on Jeep models that have no connection to BMW or Land Rover. Furthermore, the BMW X5 that emerged after the company divested itself of Rover owed more to BMW's own 5 Series platform and used a development of the four-wheel drive system that had been in the company repertoire since before the purchase of Rover Group. Concerning the new MINI, the

vehicle was proposed by BMW, not its Rover subsidiary, even though the style clearly paid homage to the British original.

Rover itself needed to design a new range of vehicles in place of those that presumably would have come out of the alliance with Honda and this involved a complete restructuring of the Rover Group's R&D capability. This necessarily resulted in a substantial delay and the only new Rover model to emerge during BMW's tenure was the Rover 75, released in 2000, and having little in common with any BMW model. Some commentators believe that the front-wheel-drive 75 was based on a rear-wheel-drive BMW 5 Series platform, mainly due to the existence of a transmission tunnel down the centre of the Rover's floorpan, though MG Rover later found when developing the rear-wheel-drive version of the 75 that the rear of the floorpan had to be adapted just to make room for a differential. At least the electrical system for the 75 did have a BMW base, which then caused problems for MG Rover when attempting to have it interface with the V8 engine sourced from Ford. There were indications that BMW was planning to increasingly integrate Rover into the BMW infrastructure, the new Range Rover being well advanced by the time Land Rover was sold to Ford in 2000 for £2bn (Brady and Lorenz, 2001) and on release in 2003 it was installed with BMW engines. If BMW had further subsumed the mainstream models of Rover Group strategically in this way it could conceivably have led to further delays in model releases, perhaps for the BMW branded vehicles as well.

Although BMW provided the investment funds that Rover Group's low output denied it, this still did nothing for output during the interim. From 1994-1999, Rover Group's share (including Land Rover) of the passenger car market in the UK fell as the products that had come out of the JV with Honda steadily aged (see Table 7.10):

Table 7.10 Rover Group's share of UK market

Year	Market share %
1994	12.8
1995	12.3
1996	10.9
1997	10.0
1998	8.6
1999	6.5

Source: SMMT/Parliament Report, 2000

Financial losses deepened in parallel with the loss in sales (see Table 7.11), although Rover Group management disputed the scale of the losses and even claimed a notional profit (Brady and Lorenz, 2001).

Table 7.11 Rover Group financial losses

Year	Financial loss (£m)
1995	158
1996	119
1997	92
1998	642
1999	750

Source: Parliament Report, 2000

The strength of the British currency at the time suppressed Rover Group's exports while the company was slow to capitalise on the relative reduction in cost of imported parts, gradually raising the proportion of imported parts in the Rover 75 from 15% to 25-30% (Brady and Lorenz, 2001). In 1999, BMW sought government aid for its British investments and was promised £152m in public funds on condition that it invested £3.3bn to secure future UK production. Suspecting that this contravened European regulations on state aid, the EU Commission announced an investigation that would last for several months into 2000 (Parliament Report, 2000). When, in mid-March 2000, BMW finally decided to cut its losses and divest itself of Rover and Land Rover it immediately felt the benefit as its share price rose 30% on the news

(Business Week, 2000). After decades of mergers and consolidation, Rover once again found itself independent.

7.7 MG Rover – autonomy and sustainability

During the disposal process Rover became the subject of a short bidding war between Alchemy Partners, led by John Moulton, and Phoenix Venture Holdings (PVH), owned by John Towers, Peter Beale, John Edwards and Nick Stephenson through their financial vehicle, Techtronic (2000). Alchemy Partners considered that Rover was not capable of supporting a three-model range of saloon cars, particularly as two were already outdated, and intended to build on the MG sports car with the Longbridge workforce reduced by half to 4,500 (Holweg and Oliver, 2005). This created some political resistance in the UK while BMW was unsettled by the possibility that under the Insolvency Act (1986) a deal with Alchemy would leave it exposed to Rover redundancy payments should the company fold within two years (Brady and Lorenz, 2001). The PVH bid then came to the fore, comprising:

- Purchase price of £10 (never actually paid)
- £500m in loans and stock from BMW (including £427m loan), repayable by 2049 or if Rover was sold (£275m immediately, £225m within 3 years)
- Production of 200,000 units a year
- Redundancies of 2,000 personnel (from 8,800) at Longbridge

Under the private ownership of PVH, MG Rover consolidated all functions at Longbridge. Rover's R&D facilities were split with Land Rover though it was claimed that around 600 engineers were retained by MG Rover (Automotive News, 2001). The company inherited the new Rover 75 and the Honda-derived 25 and 45 while MG was launched as the sports variant of the existing saloon range in addition to the MG-F sports car. Apart from body panel stamping, which stayed with BMW and so was sourced from the company's facility at Swindon, MG Rover had the basis of a full-function structure all situated at Longbridge. However, scale was another matter and in this respect the company was substantially uncompetitive within the definition of the prototypical automobile company which prescribed output of

600,000 units a year and an R&D strength of around 1200 engineers (see section 5.5 above). In comparison to MES_P, therefore, MG Rover had R&D at half the necessary strength and production capacity at a third that deemed necessary by the paradigm. The company therefore needed to establish a strategy for approximating to the paradigm, either internally or externally, in a manner sufficiently to ensure its sustainability.

7.7.1 MG Rover internal approximations – literary sources

Internal approximations to the automobile industry paradigm include two possible approaches. The first is to extend the model production runs and so achieve high levels of capital use over a longer period (see section 6.2.1 above). As has been shown (see section 7.6.3 above), lack of funds had previously forced the company to extend production runs and so miss out on joining Honda in successive new model programmes. On independence, MG Rover had no complete new models ready for release, except for the estate/stationwagon version of the Rover 75 that had been developed, and cancelled, under BMW. Costs of complete new model development has been estimated to be up to £1bn (Observer, 2004), although this thesis has argued that annual R&D costs of continuing new model programmes can be as low as £250m a year (see section 4.3.5.1 above). Even the lower figure was beyond what the company could budget for so it was obliged to continue with the models it inherited until it could find a strategy to introduce models of its own. The contextual sources (see section 7.1 above) were unanimous in agreeing that extending model production runs is not an appropriate strategy in a globalised industry where manufacturers are in unfettered competition with one another, except perhaps when an established platform can be used as the basis for a new low cost variant (e.g. Renault Logan).

Intensification of the production capacity at Longbridge offered the second alternative for approximating to the automobile industry paradigm. This would have meant introducing model variants to serve market niches, raising total output towards the target of 200,000 a year. By 2001 the company had a full line-up of MG variants of the three Rover models, although the rugged looking "soft-roader" version of the Rover 25, Streetwise, did not appear until 2003. In that same year two new models were released, the MG SV and the CityRover, but since both of these were

manufactured elsewhere (Italy and India, respectively) they did nothing to intensify the use of Longbridge production facilities. Furthermore, despite the introduction of the MG variants, the slide in production output first experienced under BMW ownership continued with PVH (2000-2005). Once again in its history the company suffered the effects of a strong currency and lack of global purchasing power (Financial Times 2002b), offset slightly by home market sales buoyed by a strong domestic economy. Table 7.12 shows the slide in production for complete years under both ownership regimes.

Table 7.12 Longbridge production output 1999-2004

Year	Production output
1997	364,350
1998	303,800
1999	227,743
2000	174,885
2001	163,144
2002	142,928
2003	136,065
2004	107,583

Source: Holweg and Oliver, 2005

Although data shows that the Longbridge installation was capable of producing the targeted output of 200,000 units a year (Automotive News, 2001), the fall in production was so relentless that it is difficult to see how the trend could have been reversed without entirely new models. Empirical data gathered by this research reveals some debate within the company concerning the potential for continuing with the existing product range.

7.7.2 MG Rover internal approximations – contemporary views

Emphasising the age of MG Rover's models, Mr Takeshi Sumita of erstwhile partner Honda mentioned that the Rover 25 and 45 were based on the Honda Civic of 1990-98 vintage. Dr Chris Millard (6 January 2004), head of strategy for MG Rover, believed that obsolete products could find a new lease of life in new markets because they would appear to be fashionably novel. In any case, he believed that the underlying technology hardly changes:

"So the ability to move your product around the world and prolong the life of the vehicles way beyond what you'd normally expect and generate much longer returns".

However, Mr John Tweedy, head of international markets for MG Rover, did not echo this view. His experience was that foreign markets were becoming more sophisticated:

"We could have said that sort of thing about China a few years ago, that they were happy to take cast-offs, but the market is evolving, they know what the latest models are. In many cases the latest generation are all built in China."

Mr Tweedy put greater emphasis on organising production to minimise costs, claiming that with 6,000 employees the company had the same output as a so-called lean operation with 60,000 employees. Mr Rob Oldaker, in a letter (24 November 2004), similarly claimed that the company had achieved remarkable efficiency in production although in preparing this thesis little independent evidence was found to support these views. However, in an interview with Automotive Engineer (2004), Nigel Taylor, programme manager large cars, described how production of the new V8 vehicle platform was included in the existing large car manufacturing system, without any need for batch building, by the simple provision of sub-assembly stations. In an interesting comment to this research Mr Rob Oldaker (6 January 2004) noted that flexibility can also be a problem, encouraging a short term perspective. The company's own V8 platform might be a good example of this, being a new platform but having a planned production of only 1000 a year and only for as long as the original Rover 75 platform remained in production.

This thesis has noted that flexible production allows a company to diversify the risk of production variations by rescheduling production to different models. Although MG Rover had a flexible production system, with all of its models ageing in the market there was no possibility of switching production to new or more popular models to compensate. Evidence relating to contextual companies has shown that flexible manufacturing is only of use when the model range in sum can fill the available production capacity, but it does nothing to correct for a net decline in sales. Furthermore, MG Rover was not in a position to extend the product life cycle due to the largely undifferentiated nature of the models, increasing sophistication of foreign markets and the need to develop products in line with new legislation. This research could find little in the company's production facility that would compensate for its lack of competitivity within the automobile paradigm. Possible external sources of advantage were therefore investigated, firstly with regards to globalisation.

7.7.3 MG Rover and globalisation – empirical data

Chapter 6 of this thesis discussed the opportunities presented by globalisation that might be available to an automobile manufacturer. However, results from interviews conducted within the contextual industry, and discussed earlier in this chapter, show that full-function firms that are competitive within the automobile industry paradigm (i.e. production output above MES_P) only exploit global opportunities for incremental benefit by way of extensions from an established structure, thus maintaining the competitive *status quo* within the industry. MG Rover was sub-optimal within the automobile paradigm and therefore required to make a quantum change in the way it exploited opportunities. In particular, this thesis argued that international factor endowment differentials represented potential for an international restructuring of the company.

MG Rover made an interesting case with regards to global structuring because its international development had been put into reverse when it was relinquished by BMW in 2000. Many of the respondents had experience of the company's global stretch in the days of BL and Rover Group so were able to draw contrasting examples with MG Rover. Table 7.13 summarises how a global structuring brought advantages and disadvantages to selected functions. For example, Mr John Bacchus and Mr Peter

Woods observed that Rover Group had found superior R&D and production facilities in Japan. Mr Woods also pointed out that exposure to Japanese methods created pressure to improve on the home-based British operations, and this can be related to the inclusion of factor efficiency by Schott (2003) in factor endowment differentiation.

However, as noted by international theorists such as Hymer, there are costs involved in dealing with foreign markets and Mr Kiff emphasised this view (see Table 7.13). Mr Bacchus noted the increase in product complexity in trying to serve those new markets. He believed that when the production facilities were wholly owned it created general overcapacity by duplicating existing facilities elsewhere, most notably at home. All the respondents noted problems with coordination at a global level and Mr Woods pointed to the long delivery times of components. It was therefore Mr Tweedy's view that interim facilities were inadequate, the best long-term solution being a fully committed production facility as part of a coordinated global structure. However, as this thesis has argued, building new plants that met the requirement of MEPS meant expanding in units of MEPS, and this is a strategy that tends to only be accessible to larger firms producing higher than MES_P.

Table 7.13 Elements of global industry – strengths and weaknesses

Data Source	Unit of Analysis	Strength	Weakness
Mr J Kiff	Japanese production Overseas production	Transferable Market proximity	 Hidden costs
Mr P Woods	Rover production in Japan Japanese market	Partner in situ Pressure to improve	Long delivery time Assembly problems High cost
Mr J Bacchus	International sales Overseas production		Product complexity Overcapacity
Mr J Tweedy	Overseas production		High volume only

When BMW sold MG Rover in 2000 the British company lost its international structure. As this was being rebuilt it provided the research with a unique insight into how international operations can be started without antecedents, perhaps indicating how a novel approach might arise. Sources at MG Rover were asked to give more detail on the rebuilding of international sales networks. Table 7.14 illustrates the

various options open to the company for meeting the challenges of global markets, including some historical data from pre-independence.

Table 7.14 MG Rover- market characteristics and strategic responses

Data Source	Market Characteristics	Strategic Options and Responses
Mr J Tweedy	Loss of BMW sales network Low volume sales New market search Closed market Market opportunism	Multifranchise Niche product Largest markets first Local partner Current models only
Mr J Kiff	Market entry Dealer volume Market knowledge	Good product Effective marketing Comprehensive dealer coverage New small car Balance customer research and management whim
Dr C Millard	Captive import (CityRover) image Market opportunism Global diversity	Dealer reputation more important Prolong obsolete model life cycle Profitable niches
Mr J Bacchus	Overseas market resistance (Rover SD1)	Adapt product
Mr R Oldaker	Low volume (Rover V8) Large brand portfolio	Niche only Strategic confusion

MG Rover representatives seemed to recognise and act upon the wide array of marketing options available, though this multifaceted response did not seem to result in international sales of a sufficient volume in the time available. Mr Tweedy, as the executive responsible for international markets outside Western Europe, was a crucial source of information. With low sales volumes and the loss of access to BMW's dealer network, MG was able to maintain a profitable presence with low sales of minimally adapted products, just as the contextual sources had described previously regarding Saab. To an extent this provided a response to Mr John Kiff's declaration that new market entry required large scale commitment to marketing campaigns and comprehensive dealer coverage. Mr Bacchus showed how the Rover SD1 had failed due to its hatchback design but, like Saab, it can be inferred that it might have enjoyed good returns as a niche product. Clearly the last MG Rover products, such as the new V8, fell into this category. This also indicated how firms with output at MES_P, much lower than the industry leaders, could nevertheless find a profitable market share.

The problem with MG Rover's approach to international markets was that there appeared to be little in the way of a coordinated strategy. As Mr Tweedy declared, it was a case of "going for the low hanging fruit". While this might equate to the Stage 1 of the Uppsala internationalisation model there was no suggestion that this was part of a planned series of steps. As Mr Oldaker stated in reference to the Indian sourced CityRover, short-term opportunism seemed to be the guiding principle. This thesis has looked at international factor endowment differentiation as an opportunity for a restructuring and in order to reveal where factor endowment differentiation might occur the interviewees were asked to categorise the level of internationalisation appropriate for specific company functions. A summary of the results is shown in Table 7.15. For the respondents at MG Rover, reduction of production costs represented the main attraction for operating foreign facilities, although Dr Millard mentioned that specific technologies might also be sourced internationally. None of the respondents detailed exactly where the competencies they mentioned might be found, indicating that they were not ready to propose an international restructuring of the company.

Table 7.15 Differentiation of global resources

Data Source	Source of Competency	
	UK Base	Global
Mr M Harbour	Design Brand sensitive	Low cost production
Dr C Millard	High value products Design skills Marketing Export production for niches Knowledge Equipment	Low value products Production skills Learning Technology
Mr J Tweedy	Export production for niches	High volume production
Mr J Kiff		Powertrain

Instead of seeking new opportunities that would have a strategic impact MG Rover seemed to be attempting to exploit its existing structure. This indicated that the company had a similar strategic view of global opportunities as the industry leaders. However, MG Rover was short of MES_P and so it was crucial that the company should conduct a fundamental review of its structure and how this related to global opportunities. Commentators inside and outside the firm generally agreed that MG Rover needed a partner in order to find long-term sustainability. Although OLI

paradigm is less powerful as a tool for formulating a strategy it can be used to describe capabilities and how these might link with external resources. The next subsection of this thesis will therefore evaluate how MG Rover might have accessed additional capabilities through a collaborative relationship.

7.7.5 Collaboration – MG Rover literary sources

According to Bailey (2003), under the ownership of BMW the factories at Cowley (Rover 75, from 2000 the MINI) and Solihull (Land Rover) received investment in preference to the Longbridge plant, which was also manufacturing the original Mini. Longbridge facilities improved slightly when the Rover 75 production system was moved to the Longbridge site and the old Mini phased out in 2000. However, Bailey concluded that the MG Rover models were ageing, requiring new model development, either independently by MG Rover or with a partner. The alternative was a reduction in output to small-scale, niche sports car production.

"For this reason, many industry experts do not believe that MG Rover has a viable long-term future" (Bailey, 2003, p.73).

The most pressing need, therefore, was to invest in R&D for a new model range and the only funds available were the £427m interest free loan from BMW, repayable by 2049, along with the estimated £350m value of the plant and stock (DTI/Auto Industry, 2007). This research suggests that this might have been enough to inaugurate an R&D programme for a few years but not enough to replace the entire product range (see section 7.7.1 above).

Upon independence in 2000, MG Rover had embarked on an immediate search for an international partner. John Towers, the new CEO, openly discussed Chrysler and Honda as possibilities (Automotive News, 2000), though these suggestions never rose above mere speculation. As production and break-even targets were missed the company announced a collaboration with a division of China Brilliance in March 2002 to develop a new small car. Originally billed as central to the future of the company, by the time the deal started to go awry just months later the criticality of the deal was being downplayed. Concurrent deals were being sought with Tata in India

for a possible small car and the Daewoo production facility in Poland as a possible bridgehead for Rover's entry into Eastern Europe and production base for export (Automotive Engineer, 2004). Professional Engineering (2003) reported optimistically on the release of the CityRover, based on Tata's Indica, and the Streetwise, based on the Rover 25 (p.27):

"So if MG Rover is serious about wanting to grow, it may eventually have to attract and cede its autonomy to a major player. For the moment, it's all to play for."

Automotive Engineer (2004b) identified a joint venture with Proton as a possible candidate, but like the Tata relationship and the initial collaboration with Honda, this involved the supply of an existing Proton model (Wira) and using it as the basis of a new Rover. An attractive characteristic of the proposed alliance for MG Rover was that the two companies operated in complementary markets. The collaboration would have replaced the failed proposal for a deal with China Brilliance, which ended in 2003 with the imprisonment of the Chinese company's sponsor of the deal, but at least it did raise some consultancy fees for MG Rover (DTI/Auto Industry, 2007). It was also mooted that since Proton was the parent company of Lotus, the sports car manufacturer and engineering consultant, that the two British companies could work together in the kind of link alliance described by Dussauge *et al.* (2004).

Another proposition known at the time (Automotive Engineer, 2004b) was for MG Rover to take over the ex-Daewoo factory in Poland and install it with obsolete Rover 45 production hardware for sale of the model in East Europe. This also fell through in 2003 when MG Rover's bid was rejected (Professional Engineering, 2003), and in any case, there was no reason to expect the Polish market to be receptive to an ageing design. Although the proposal suggested that the firm understood it needed to rapidly increase output capacity, and another plant could have taken it close to MES_P, a jump in output volume of this magnitude would have been very risky for a firm of this size. This is a problem inherent to small companies: they need to expand output to achieve MES_P, but have to do so in steps that are each below MEPS. Other rumoured joint ventures included licensing of engine production in India, advising Sonalika on the design of an off roader and the possibility of licensed assembly of the Rover 75 in a remote corner of Iran. None of these were of any significance, and indeed the Iranian

deal appeared to be nothing more than self-promotion by the politician who oversaw the region.

The final possibility for an alliance came with Shanghai Automotive Industry Corporation (SAIC) in 2004, along with Nanjing Automobile Corporation (NAC) in a minority role. SAIC was in production JVs with VW and GM in China but had no vehicle designs of its own, although it had just acquired the Korean SUV manufacturer Ssangyong (DTI/Auto Industry, 2007). The Chinese company paid MG Rover £67m for the property rights to the Rover 25 and 75 along with the K Series engines (Holweg and Oliver, 2005) but was reportedly annoyed by speculation that it was about to invest £1bn in MG Rover (DTI/Auto Industry, 2007), a figure that concords with some estimated costs of new model development and this thesis argues would have sustained R&D for four years. The proposed deal foundered in March 2005 concurrent with the financial collapse of MG Rover. Holweg and Oliver concluded that SAIC's intention had been to gain access to MG Rover's intellectual property rights (IPR) and production equipment for use in its Chinese plants, which it would be better able to do if it bought them outright. However, against global competition, SAIC would have had the same pressing need to replace the model range as did MG Rover before it.

Holweg and Oliver (2005) concluded that MG Rover started out in 2000 with an ageing product line that was suffering declining sales in a shrinking market segment and so lacked the incoming funds to invest in new models. This made the need for a JV partner critical to its long-term survival, and due to the production overcapacity in the West only partners in rapidly growing developing markets, such as China and India, would be suitable. However, it is the view of this thesis that Holweg and Oliver, like many others, take too narrow a view of MG Rover as a source for partners of automobile models. They demonstrate MG Rover's need for a partner to bring salvation but do this so comprehensively that they leave no reason why a partner should be interested. With MG Rover apparently inadequate in every major area, from the model line-up to R&D investment, there did not appear to be anything that MG Rover could offer an interested party. On this basis the company was only worth the value of the land it stood on, much of which had been sold a year before, and the value of its more general purpose production equipment. Certainly, after a pessimistic

assessment of MG Rover's product range, it is difficult to see how any prospect would be attracted to the company's IPR. It is the view of this thesis that the company did indeed have value as a contributing partner in an automobile manufacturing alliance, but only if it drastically reduced the scope of its activities.

Lack of scale in all its functions meant that MG Rover had little to offer in terms of production capacity, and indeed in the one partnership that it did form, with Tata, production took place in India even while Longbridge was operating well below capacity. Furthermore, the available capacity at Longbridge was relatively low at a declared 200,000 units a year, competitively close to MEPS for one plant but a third of MES_P, so a scale alliance would have necessitated investment in new facilities and a tripling in market demand. However, R&D was only half of MEPS for the process and this could have been more rapidly expanded than could production output since the core team of engineers was already in place. A link alliance, therefore, would have shown more promise, but only related to the transfer of knowledge concerning new models, not the existing range. A link alliance in R&D for MG Rover would have served the purpose of intensifying its R&D activity and thus improving output in that function.

In the case of MG Rover it is not possible to make a direct comparison with the figures for R&D since it did not release any new core models, although it did release a number of interesting variants of the range it inherited from Rover Group when it was sold by BMW in 2000. In line with Table 4.8 shown previously, Table 7.16 presents the R&D results for the company as surveyed by the DTI for the periods 2002/3, 2003/4 and 2004/5 (DTI 2003; 2004; 2005). The peak period, 2003/4, was boosted by additional funding due to the evolving alliance with SAIC of China, while 2004/5 was cut short by the financial collapse at MG Rover. Each of the three years is therefore a special case in its own right; nevertheless the disparity between R&D expenditure at the MG Rover and the rest of the industry is of a magnitude so great that comparisons can still be drawn.

Table 7.16 MG Rover R&D expenditure, 2003-5

Year	R&D Expenditure £m	R&D Expenditure % of sales	R&D Expenditure/employee £
2002/3	45.5	2.7	6,800
2003/4	90.5	5.2	13,700
2004/5	23.9	1.4	3,700

Sources: DTI, 2003; 2004;2005

If 2003/4 is taken as indicative of a period during which new model R&D was progressing at an acceptable pace then it is instructive to compare this with other car firms at the same time. Table 7.17 does this for the same companies that were shown in Table 4.8 (period 2005/6). While it shows that MG Rover R&D as related to sales and employee numbers was within the industry standards it only shows the rate of investment; it is the measure of the fixed cost requirement for new model programmes that is more interesting. As was previously shown in Table 4.8 there is a great deal of disparity in absolute levels of R&D spending. Ford and Toyota's R&D budget for that year was up to forty times larger than MG Rover's. These are the industry leaders in terms of total output and have much wider product ranges to develop, as well as a certain amount of pure research outside of the automobile paradigm as it is defined here (e.g. fuel cell research is unrelated to the Powertrain function in the paradigm). Subaru was identified in Chapter 4 as indicative of MEPS for the R&D function and it can be seen that MG Rover was investing about a third of Subaru's financial commitment for the same year. Although this was well below the minimum required, around £250m according to this research, in absolute terms this amounted to a requirement for around another £160m; compared to other firms in the industry, this was not a large sum.

Table 7.17 Global R&D Expenditure 2003/4

Company	R&D Expenditure £m	R&D Expenditure % of sales	R&D Expenditure/employee £
Ford	4189.7	4.5	12,800
Toyota	3484.0	4.3	13,200
Subaru	313.3	4.4	11,400
MG Rover	90.5	5.2	13,700

Source: DTI, 2004

Although by industry norms MG Rover's R&D staffing level compared poorly with output (see Table 7.18 below) the company enjoyed heritage benefits from the investment made by BMW and had also shown some ability to explore new projects (see Table 4.14 above). The proposed joint venture with SAIC would have resulted in an effective increase in output by gaining access to the Chinese plant and market (DTI/Auto Industry, 2007) supported by an increase in R&D engineering staff. The staff numbers would have then been sufficient for MEPS in R&D, while production output of 1m units a year would have exceeded that which this thesis has argued would be necessary for MES_P.

Table 7.18 MG Rover R&D productivity

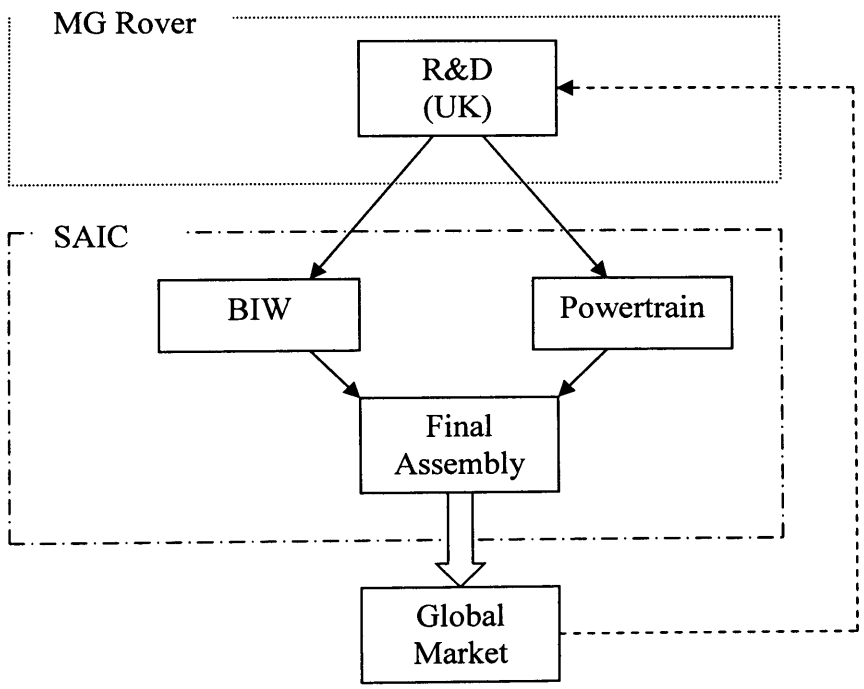
Company	R&D Staff	Output (millions)	Ratio Staff : Output
MG Rover (target output)	500	0.20	1 : 400
MG Rover (2004 actual output)	500	0.11	1 : 216
MG Rover – SAIC (combined target output)	700	1.00	1 : 1429

Source: Financial Times 2005g
Automotive News 2006b
JAMA 2005a

These speculative figures taken from media sources in Table 7.18 for MG Rover indicate the kind of productivity that was available in R&D. In such a scenario, MG

Rover would use its product development function to support the brand and would look for a partner that was devoid of a product brand but could offer substantial production capabilities. This would have resulted in a link style alliance, but one where any *ex post* advantages in R&D would only accrue directly to MG Rover if it had primary responsibility in that function. This would only be possible if the partner had little or no R&D capability of its own but was competitive within the industry in terms of production scale, a scenario that describes a number of emerging economy manufacturers. However, it also implies that significant production at Longbridge would have had to cease in favour of production facilities operated by the partner. With advantages in the functions accruing to the partner responsible, long-term stability could have been achieved. Furthermore, each partner would continue to exploit the international factor differentiation advantages of its home region. Figure 7.3 depicts how the resultant IVJV might have looked with SAIC.

Figure 7.3 Proposed IVJV between MG Rover and SAIC



The suggested closure of Longbridge as a production site recognises that an organisational joint venture structure of this kind is not sustainable between companies that operate existing full-function structures. This precludes producers

such as Proton or Tata that had attractive production capacity but also had product strategies of their own (Automotive Engineer, 2004). It is in accordance with this view that the purported alliances with these companies failed to develop.

Although the IVJV seems to have a solid theoretical basis a significant problem concerns a suitable governance structure. This thesis has found that a development of the U-Form of governance structure has tended to prevail over the M-Form, particularly amongst Japanese firms, but such a centralised form of management control would not be applicable between independent parties. The example of GM and A O Smith (see 6.5.1 above) suggested that the M-Form might be more appropriate since it describes the separation of strategy from operations. However, the IVJV is missing two crucial features: the transfer of objective data for strategic analysis, and the existence of a designated headquarters. Neither of these factors can be taken for granted between independent parties without being explicitly implemented. The following sub-section will investigate the empirical evidence for the potential of the IVJV relationship, including data gathered from Chinese manufacturers NAC and SAIC after the collapse of MG Rover, in order to gain a closer understanding of the organisational and governance structures.

7.7.6 Collaboration – MG Rover empirical data

Although MG Rover exhibited the organisational structure of the full-function model it lacked the scale in production signified by MES_P to be competitive within the precepts of the paradigm. Other manufacturers in a similar predicament, such as Aston Martin and Bentley, had larger parent groups to mask the cost disadvantages. MG Rover was therefore exposed to all the cost disadvantages of being sub-optimal within the paradigm. The company attempted to exploit its economies of scope in management by operating an additional production site in Poland in the former Daewoo plant, as well as other rumoured collaborations, but it lacked the resources to make the required strategic commitment. In any case, even increasing the economies of scope in the product range with the creation of a parallel MG brand was insufficient to fill production capacity at its one existing plant in Longbridge. The remaining option was to find an externally based approximation of the automobile paradigm and this meant collaborating with one or more other manufacturers in a

suitable alliance. Although this thesis has put forward the IVJV concept this does not mean that MG Rover had reached the same conclusion. Table 7.19 summarises the search for a partner from the perspective of MG Rover, including the assets that were being looked for and the outcome.

Table 7.19 MG Rover – search for a partner

Data Source	Partner	Assets		Future Potential
		MG Rover	Partner	
Dr Millard	Various	R&D efficiency	Powertrain Financial resources	Technical dependency Long-term
Mr R Oldaker	Large group Tata Large group	Brand development Technology R&D efficiency	Common components New product Production capacity	Premature end
Mr J Tweedy	Various	Product IPR Market access Uncompetitive size		Premature end

The table shows a great deal of speculation on the nature of the partnership that MG Rover required and the competencies it could offer. Dr Millard, head of strategy for MG Rover, asserted that a problem with looking to other companies for input, such as powertrain supplies, was that it was necessary to accept their specifications and policies. Dr Millard felt MG Rover lacked only financial resources, a difficulty that has been commented on elsewhere, but claimed that the quantity of financial investment necessary in 2004 was not as great as it had been previously. This seemed to imply that cost recovery was not as onerous as many critics of the company believed, although of course the company was at no point close to achieving its output target. It also suggested a lack of urgency to the search for a partner. In the event this proved to be an inappropriate position, although the company did have capabilities to offer a potential partner.

There was some evidence that the company was effective in its R&D function and Dr Millard noted that the costs of independent design had come down significantly. He gave the example of crash test analysis using Linux clusters, which two years previously would have taken up to three days, but could now be completed in three hours using software costing less than £100,000. Dr Millard felt that the experience of

the engineers was more important than the software system. This human asset was difficult to purchase yet accessible to MG Rover because previous partnerships had sustained the knowledge base of the company. This resulted in what Dr Millard believed was a small, elite R&D team at MG Rover:

"You could not hire 300 engineers and start to do what we do out there [in the R&D centre]; our inventory goes home at night. If we didn't carry the breadth of skill that we've got, people who have delivered programmes with Honda, people who have delivered programmes with BMW...[then we would not be] able to continue to iterate and move those programmes on as ever they are."

This view gave empirical support to the findings of this research that suggested R&D costs for a basic model range are not as high as many industry commentators believe. Mr Oldaker envisaged that R&D should be arranged like a Formula 1 team, a small team of experts, "difficult people to manage" but dedicated to the end result. Although he was not as confident as other respondents on the long-term viability of MG Rover as an independent manufacturer, he believed that the company needed a larger partner that would acknowledge MG Rover's potential in R&D. He seemed to think that the company could sustain autonomy in that area at least.

The last partnership entered into by MG Rover before the financial collapse in April 2005, that with Tata of India, illustrates the inability of the company to build on its strengths or correct its weaknesses. It might have been expected that the alliance with Tata would have either exploited MG Rover's R&D capabilities, or filled vacant production capacity at Longbridge. Instead, it brought a new product to Rover that was neither designed nor manufactured with MG Rover as a partner. As Mr Rob Ball stated, nothing was transferred to Tata although MG Rover did provide some advice in order to "Roverise" the car for the UK market. Dr Chris Millard also described the relationship as "piggy-backing" on Tata's operation. Although the additional volume was of incremental benefit to Tata it had no bearing on its decision to manufacture, the vehicle having been in production as the Indica since 1998 and being taken up by MG Rover only in 2003. It cannot, therefore, be considered a link or a scale alliance under the theory of Dussauge *et al.* (2004) and was more reminiscent of a franchise type agreement, albeit without the Tata brand.

Despite the inappropriate structuring of the relationship with Tata, according to Mr Tweedy there was no shortage of potential partners. In order to discover what MG Rover believed it could offer potential partners interviewees were asked to describe the range of capabilities at MG Rover. Dr Millard reiterated MG Rover's attraction as a non-competing partner:

"It wouldn't worry me if a [Rover] 75 was built on the other side of the world by someone who shared in its development in the future. It wouldn't really be damaging to our market position in this country and the territories we compete in."

Mr Tweedy elaborated further MG Rover's attraction to a potential partner: attractive products and market access combined in a company of unthreatening size. He reported that the company was receiving "plenty" of invitations from companies interesting in collaborating and that MG Rover had a team, headed by Mr Dave Ruffell, specialising in evaluating them:

"So, by a very logical process, we find that we are at the end of the telephone for a number of people that are looking for a company that is not too big, not already established and offer them a lot of potential."

Despite this, the company did not seem to fully comprehend how an alliance might serve its interests. Mr Tweedy categorically denied that MG Rover was taking a systematic approach to collaborations, instead apparently entertaining offers as they came in. He mentioned Iran as a large but closed market that would require a local partner in order to penetrate it. He implicitly acknowledged the existence of an automobile industry paradigm when he pointed out that most full-function companies, as defined by this research, would be of a much larger size than MG Rover and already operating internationally. They would, therefore, already be in competition with any potential partners they might be looking for. This again highlighted the short-term character of link alliances, *ex post* asymmetrical advantage being exploited at the expense of the weaker partner. He did not rule out forming a network of alliances if the "incompatibilities" could be worked out. The comments on the impact of joint ventures, particularly pertaining to MG Rover, are summarised in Table 7.20 below.

Table 7.20 MG Rover – Impact of joint ventures

Data Source	Partnership	Impact	
		Immediate	Continuing
Mr J Kiff	MG Rover – Honda and BMW		Product development
Dr C Millard	MG Rover – Honda and BMW MG Rover – future partner MG Rover – TWR Rover - Honda	 Drive initial improvement New product (Legend/800)	Established base for independence None: internal resources Premature end Honda controlled specification
Mr R Oldaker	MG Rover – Honda MG Rover – TWR MG Rover – ProDrive MG Rover – V8 partners	 Digital design MG Rover initiate and conclude New engine	Development integration Not so cost effective
Mr R Ball	Honda - Rover		None: learnt little from Rover
Mr J Tweedy	MG Rover - BMW MG Rover - Tata MG Rover - Suppliers	International sales New product Cost reduction	Loss of network Body pressings Premature end Supplier innovation

The table shows that the immediate effect of various relationships tended to be financial or to fill a gap in the product range. However, Dr Millard, head of strategy at MG Rover, was explicit that in the long-term the core resources should be internalised, particularly with regards to coordinating and integrating vehicle development projects. MG Rover had engaged external companies to work on new projects: TWR on the new medium car (RDX60) and ProDrive on the rear-wheel drive Rover 75 V8. In both cases, MG Rover had project control problems: firstly with TWR when the company collapsed, taking much development work with it, and secondly with ProDrive in monitoring the progress of the work. This is an oft mentioned weakness of link alliances, one partner taking advantage at the expense of the other.

There was no mention of the company having an interest in a scale alliance where it shared output with another manufacturer. The general consensus at MG Rover was that the company had core capabilities that should be defended as an independent concern and, although assistance was needed in the form of funds and temporary new

products, the vertical relationship with suppliers was the only likely long-term partnership for the company as it was then structured. There was no apparent intention to restructure the company, either globally or functionally, and in this regard it shared the same strategic outlook as the contextual industry. Perhaps most extraordinarily, 18 months after the collapse of the company, Mr Stewart McKee (17 July 2006), ex-PR representative of MG Rover, stated that the company's chief executive, Mr Kevin Howe, had managed to convince the leadership of PVH that the company could be independent in the medium-term and so there was no immediate need to finalise a JV. This was also the impression gained from many of the other interviews.

It can be inferred from Mr McKee's comments that the senior management of MG Rover were unaware of the unique capabilities at the firm and the opportunities that existed externally. The company needed to bolster its production scale while exploiting its economies of scope in R&D. This naturally indicated that it needed to find a partner that could provide additional production output in exchange for MG Rover's R&D input. As the link-scale alliance theory has suggested, and the company found in its own experience, simply forming a relationship with another company was not enough.

Perversely, the relationships it formed tended to pass the benefits to the partner: TWR and ProDrive exploited their own capabilities in R&D while Tata gained scale benefits in production, both of these while capacity in these functions at Longbridge was underused. Furthermore, despite its own experience, the company did not structure the relationships in such a way to head-off *ex post* problems, the demise of TWR leading to a defensive internalisation of R&D rather than a restructuring along functional lines with a new partner. If the senior management understood international factor endowment differentiation at its most basic level (i.e. low labour cost locations) then its exploration of production in Poland showed that there was no commitment to restructuring the company around the opportunity. Sourcing production of the CityRover small car in India was not reflected in a lower price in the UK retail market but instead the price was maintained at UK market levels as a tactic for improving cost recovery. Since the product's provenance was well-known in the UK market the pricing strategy contradicted consumer expectations of a relatively low-priced product and thus sales were far below company projections.

Although the company was active in pursuing different opportunities without a systematic approach these explorations could not result in a unified strategic direction. The result was therefore of a company that was static and defensive when only a dynamic response could have brought it into a position of sustainability. Burdened with an uncompetitive cost structure MG Rover was forced to consume its internal resources simply to sustain itself. Over the period of PVH ownership of Longbridge, 2000-2005, with output falling the available cash was used for operational needs rather than future investment.

A lack of cash is not the cause of a company's collapse but the result, so in the case of MG Rover the conclusion must be that, given its unsustainable form, time was of the essence in the search for a joint venture partner. This thesis has argued that MG Rover's R&D alone demonstrated a relative advantage, albeit still requiring significant additional resources, so the only real potential for the company was as the provider of R&D knowledge in a VJV where its role would be protected from *ex post* appropriation by the partner. Instead, though, the MG Rover management seemed to prevaricate on what the terms of a JV should be. Part of this problem would have concerned governance; effectively, which party would determine overall strategy. With SAIC both wealthier than MG Rover and closer to the largest market it could be anticipated that the Chinese company would dictate future model programmes.

Such considerations were ultimately irrelevant. The subsequent collapse of the company laid out the assets of the company for interested parties to choose from almost without hindrance, thus reconstructing on their own terms the form of their preferred JV. Nevertheless, the logic of the VJV is designed to bring benefits to both parties so the VJV structure may still emerge even when all negotiating power has passed to one party. It does, though, suggest that the resultant structure will be a variant of the VJV structure that would have occurred between two independent parties. The following sub-section will evaluate these considerations using literary sources and empirical data.

7.8 MG Rover assets – reconstructing the international vertical joint venture

In April 2005, PricewaterhouseCoopers acted as official receivers to dispose of the assets of MG Rover. By July that year the process was largely complete, with the main physical assets and the MG brand being sold to NAC, previously the minor party in the proposed JV with SAIC. The lack of production locational advantages in Longbridge were confirmed when NAC proceeded to extract the production equipment and move it to a new plant in China, re-starting production in March 2007. Although NAC had the physical means of production it did not own the product designs, which had been previously secured by SAIC during negotiations for its aborted IJV with MG Rover. NAC therefore had to reverse engineer the products in order to derive the technical designs. NAC found ownership advantages in the MG brand while SAIC attempted to similarly obtain the Rover brand name but without success as Ford took up on option to purchase the brand from BMW in September 2006.

The division of MG Rover between NAC and SAIC took in some of the elements of the OLI paradigm. The total investment by NAC and SAIC in acquiring MG Rover's assets in the UK amounted to £110m (DTI/Auto Industry, 2007), so the companies clearly saw value in MG Rover. As owner of the physical assets, NAC seemed to perceive few locational advantages to the UK except for maintaining brand equity, which meant retaining a UK connection in the form of limited sports car production in order to provide some authenticity to the British brand image of MG (Times, 2007). At a press conference and online conference interview attended during the course of this research, NAC made the MG brand ownership advantages very clear but the locational advantages of the UK were more equivocal. Like the contextual companies, NAC gave first priority to achieving production scale by bringing its primary plant in China to full capacity production. Paul Stowe, head of quality for NAC, confirmed in an internet based interview in which the author of this research participated, that the panels for the TF would be supplied from NAC in China. Stadco, the former panel supplier for that model, had also announced its involvement (Stadco, 2006). The extent of Stadco's involvement is not clear, but it does suggest that the majority of the BIW production would take place in China rather than Longbridge.

SAIC and NAC also made some moves to divide MG Rover along human and physical asset lines. In buying the physical assets of MG Rover, NAC did not initially pursue the human assets and a senior manager of the Chinese company described how the company had acquired at Longbridge the physical R&D capability to develop entire new models but without the manpower that had existed before. He confirmed that R&D would be centred on China, the role of a diminished Longbridge R&D being to "add a European flavour" and a sense of the MG heritage to future models. The continuing purpose of R&D in the UK was to "complement the heritage of the MG brand" and "understand the talents that are endemic in the UK industry" but without making a full commitment to UK R&D.

Indeed, NAC's strategy seemed to be to recreate the Longbridge operation, encompassing R&D and production capacity, at a new site in China. This would have left the original Longbridge plant as nothing more than the European branch of the operations centred on China. The result would have been a domestic operation in accordance with the full-function model of the automobile industry paradigm but with the same problems that MG Rover had suffered at Longbridge. This meant a lack of scale in production, an ageing product range and poor exploitation of international factor endowment differentiation by relinquishing access to MG Rover's R&D capability. However, in a subsequent email (28 March 2007) the senior NAC executive confirmed that the plan had changed and that the company had decided to elevate Longbridge R&D capability so that it would be the source of all new model strategies. R&D in China would then focus on adaptations for the local market. To enhance continuity with the previous MG Rover R&D capability NAC had rehired Mr Rob Oldaker to reprise his role as the MG Rover head of engineering, carrying the title of Global Product Director, and he would then lead the expanded R&D team in a partial recreation of the original MG Rover team.

In contrast, SAIC seem to have been much quicker in approximating to the automobile industry paradigm by acknowledging earlier the divisibility of functions by asset type and factor endowment. The company was interested in the human assets of MG Rover and these seemed to have locational advantages for the company. This was at variance to what had been expected of SAIC. After MG Rover collapsed in April 2005, Holweg and Oliver (2005) speculated that SAIC would then be able to

acquire the assets that it chose, namely the physical means of production. This is not, though, what happened.

Having already obtained the rights to various model and engine designs, the company eschewed a bidding war with NAC for the physical assets and instead rehired many of the human assets of R&D, i.e. MG Rover's development engineers, forming the Ricardo 2010 R&D unit under the guidance of Ricardo UK Ltd (DTI/Auto Industry, 2007). Mr Anthony Smith, an engineer of 21 years with Ricardo and lately the company's media consultant, provided an additional perspective for this thesis. He stated that Ricardo UK Ltd offered the concept of the 2010 unit and SAIC accepted because it provided access to the human capital behind the IPR (intellectual property rights) formerly existing within MG Rover. Mr Smith emphasised that IPR is not just the product design but also the systems and experience that lies behind it.

Mr Smith asserted that SAIC's involvement in Ricardo 2010 was a low risk approach to securing technology transfer in the long-term, contrasting this with consultancies that provide knowledge only for the term of the contract. In its initial stage the Ricardo 2010 unit represented a formal JV between Ricardo and SAIC, and it exploited the international factor endowment differential in R&D that MG Rover had originally offered SAIC in an IVJV. The 2010 unit recreated most of the MG Rover design team in order to preserve the organisational capital that resides within the human assets and so replicate the proposed IVJV. However, a problem for SAIC was that the organisational capital in fact resided with Ricardo UK Ltd, and as Ricardo UK Ltd is a dedicated R&D company serving a multitude of automobile manufacturers it meant that Ricardo UK Ltd could have gained *ex post* benefits at SAIC's expense. SAIC was dependent upon Ricardo 2010 for its R&D, but without the Ricardo UK Ltd in turn committing all its R&D capabilities to SAIC the relationship could not be defined as a true VJV. It was therefore important for SAIC to impose a greater degree of control over the relationship.

The IVJV strategy suggested by this thesis could have been imposed on SAIC and Ricardo 2010 by demerging Ricardo 2010 from Ricardo UK Ltd. This would have established Ricardo 2010 as an independent party to the IVJV with SAIC. However, this does not solve the problem of a suitable governance structure for an IVJV that

would formalise strategic control. In this case the solution came in the form of SAIC's complete ownership of Ricardo 2010. As suggested by Klein (2000), by taking ownership of the Ricardo 2010 R&D unit from Ricardo UK Ltd SAIC secured access to all subsequent *ex post* benefits which might instead have accrued to Ricardo UK Ltd. It also gave SAIC control over the R&D strategy, though leaving the division with operational control. This seems to clearly reassert the M-Form of governance structure, yet this thesis argues that ownership is not a necessary condition for the M-Form in an IVJV. Had MG Rover retained its status as an independent party to the JV, then the question of governance might have been answered differently. As it was, Ricardo 2010 could never have been independent because SAIC needed to retain links with Ricardo UK Ltd; SAIC therefore needed complete ownership to offset Ricardo UK Ltd's close operational connection with Ricardo 2010. An announcement made in 2007 stated that the advantages of ownership would still depend on the locational advantages of keeping the R&D unit in place so the Ricardo 2010 unit would be preserved within the physical boundary of Ricardo UK Ltd. According to a Ricardo UK Ltd press release (January 2007):

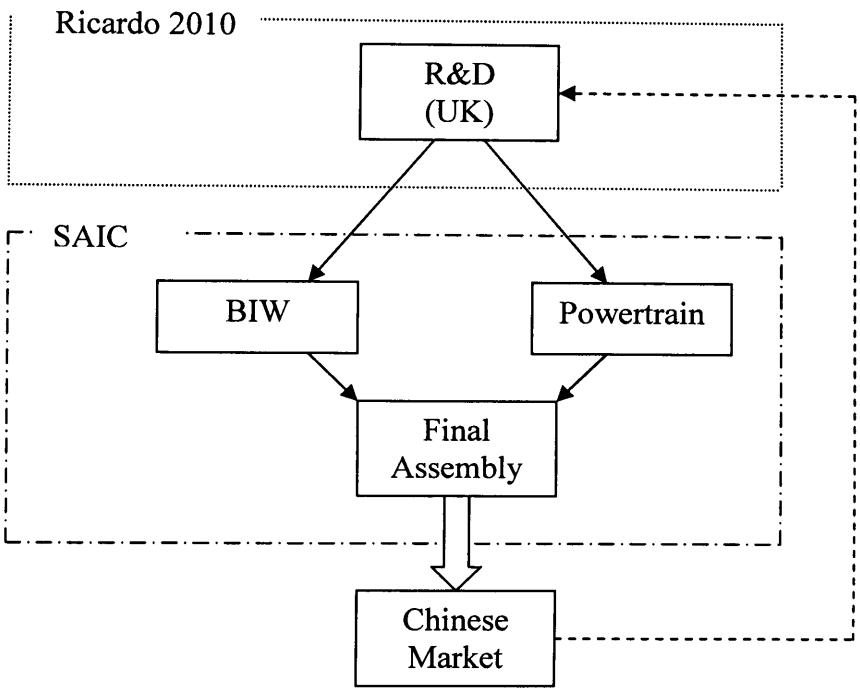
"The transferred business will continue both to be based at offices at the Ricardo Midlands Technical and have strong operational links with Ricardo UK Ltd."

Although the engineering team at Ricardo 2010 was continuing the work it had started at MG Rover the engineers reported to Mr Smith that they had gained the one resource they had previously lacked: funding. The unit's task within SAIC was to conduct advanced engineering for new models, with a workforce of around 150, effectively the same size as the R&D department at Aston Martin (see section 4.4.1 above). The engineering team includes not only some SAIC engineers from China but also representatives of Chinese supplier companies. By coincidence, the unit was operating in the same building that Ricardo UK Ltd had used in helping BMW finish the engineering on the new MINI, BMW having lost much of the R&D team when it sold its Rover Group assets.

With production and production engineering taking place exclusively in China, it was put to Mr Smith at the close of the interview that this replicated the IVJV suggested by this research; he agreed with this point of view. Just as Grossman and Hart (1986)

assert that a firm is one that has operational control of its assets, not necessarily ownership (see section 7.4 above), the spirit of a VJV relationship between SAIC and Ricardo 2010 is embodied by maintaining Ricardo 2010 as operationally separate. This is somewhat reminiscent of the M-Form of organisational structure discussed in Chapter 5 and extends to Ricardo 2010 a measure of operational autonomy. Since the Ricardo 2010 facility exploits international factor endowment differentiation Figure 7.4 shows the Ricardo 2010 R&D unit as operationally separate from SAIC, and therefore in an IVJV style relationship, even if the equity is owned by SAIC. This structure can also be applied to NAC, with Longbridge R&D taking the place of Ricardo 2010 and NAC replacing SAIC, although in addition the Longbridge plant would have its own limited final assembly capability from CKD kits.

Figure 7.4 IVJV style relationship between Ricardo 2010 R&D and SAIC



With this structure SAIC was able to exploit the division between human and physical assets, as suggested by Dussauge *et al.* (2004), and an international division according to the factor endowment theory of Schott (2003). NAC, by purchasing mainly the physical assets and moving them to within close proximity of its R&D facility in China, initially recreated the full-function structure of MG Rover but this time within the confines of the larger Chinese market. Although this would provide NAC with an

entry into the local market, since the range of vehicles has been generally considered to be uncompetitive in the global market the need to replace them was even more pressing than it was for MG Rover. Unlike SAIC, NAC had avoided the risk of hold-up when using an external R&D team by simply internalising the capability. While SAIC can build on the IPR it has purchased using the team that generated it in the first place, it would have been mostly immaterial whether NAC attempted to update the product range that was purchased (as indicated to this research by the senior manager) or design an entire new range; in either scenario NAC would have had to conduct R&D largely by itself.

Although NAC has recently begun to follow SAIC in replicating the advantages of the IVJV structure by enhancing the role of Longbridge as a site for R&D, the most recent events have indicated a consolidation of the two strategies. Under political pressure to create a Chinese automobile group that is competitive within the global industry SAIC and NAC (under the auspices of the parent group, Yuejin) have entered into negotiations to explore collaboration. Although it is not yet clear whether this will constitute a formal takeover by SAIC, it does suggest that NAC's strategy of recreating the Longbridge operation in China was no more sustainable than MG Rover's original strategy. Furthermore, ownership of the physical assets of production does not seem to have conferred any particular advantage on NAC, which has entered the market later than SAIC with its largely unchanged version of the Rover 75 and has not revealed any significant product R&D programmes. Only one process was unique in its physical assets, that of producing the advanced but ill-starred K-Series engine, and the physical asset specificity in this area is probably attractive to SAIC as it puts its own version of the engine family into production. Again, though, it is not necessary for SAIC to own the assets since it could have contracted with NAC to supply the engines until its own engine family had been brought to the market.

Should the consolidation of SAIC and NAC take place it would have no material effect on the logic of the structure shown in Figure 7.4 above. The combination of the two companies would bring benefits in scale as part of the overall trend in consolidation witnessed in the industry over the decades of the Budd Paradigm but it does not affect the advantages that are derived from exploiting international factor

endowment differentials. Furthermore, it would not weaken the advantages of maintaining semi-autonomous functions within organisational structure, as could be contained by an M-Form of governance. In this way, the status of Ricardo 2010, currently known as the UK Technical Centre, as an operationally separate R&D unit should remain unaltered and the organisational structure of Figure 7.4 remain intact.

7.9 Conclusion

In Part I of this chapter it was found that the contextual companies were mostly comprised of full-function multinational enterprises (MNEs) that were either industry leaders within the automobile industry paradigm and producing above MES_P, or were part of larger groups that were industry leaders. This research has found that they preserved their ownership advantages over their human assets by retaining the full-function structure originally established within their home base. The governance structure for this strategy seemed to be provided by the U-Form, with certain adaptations necessary to include extensions into overseas markets. Although locational advantages and factor endowment differentiation was recognised, these were subservient to the need to exploit economies of scale at existing facilities.

Part II of this chapter has shown that MG Rover had the full-function structure prescribed by the automobile paradigm, but it was far from achieving MES_P output. This has been attributed to its ageing model line up leading to inadequate income being available for investment in future models. MG Rover was therefore exposed to all the cost disadvantages of being uncompetitive within the paradigm and only lasted as long as it had funds for its operational needs. While MG Rover had advantages in its high level of functional integration, as well as brand ownership and control of human assets in R&D, its problems stemmed largely from disadvantages in production output. The company had an assembly plant with output capacity that was within a range that many other companies accepted as being reasonably close to MEPS, but to achieve MES_P the company needed at least one more assembly plant, if not two, and the one it did have never reached full capacity.

Even given its limited advantages, there was no evidence that the company understood its strengths or how globalisation in its industry offered complementary solutions. Indeed, all representatives of MG Rover gave the impression that the company was operating with the same assets and opportunities as the contextual MNEs in the industry with output above MES_P. Despite early statements concerning the search for a partner, it was only shortly before its financial collapse five years later that a suitable candidate, in the shape of SAIC, appears to have been identified. However, this was too late to save MG Rover.

The relationship between MG Rover and SAIC that was being considered conforms to the IVJV concept put forward in Chapter 6 as a means by which a firm operating inefficiently could best approximate to the automobile industry paradigm. The commercial logic of such a relationship carried through beyond the collapse of the British company. SAIC gained access to the IPR and related human assets of MG Rover through its involvement in, and subsequent ownership of, the UK based Ricardo 2010 R&D unit. This resulted in almost the same structure as the mooted IVJV, dividing the company functions into human assets (R&D in the UK) and physical assets (production in China), with additional benefits from factor endowment differentiation. Indeed, it was only the wider activities of Ricardo UK Ltd as an engineering consultant that prevented the emergence of a VJV between two fully committed partners, and thus the necessity for SAIC to take control of Ricardo 2010 in order to safeguard its R&D knowledge base. The final structure is therefore in accordance with the IVJV model but secured by equity ownership.

NAC took a more circuitous route than SAIC. As the purchaser of the physical assets of MG Rover it seems to have initially attempted to recreate the company in a Chinese setting. Access to a larger market would have brought greater production output and capacity utilisation, but this was still far below MES_P and there was no reason to expect the production capacity of the physical assets to have increased. NAC put in motion a plan to maintain Longbridge as an extension of the Chinese operations which would have ignored any possible advantages in international factor endowment differentiation. Subsequently, though, NAC took largely the same position as SAIC and elevated the role of the R&D capability in the UK.

From this it can be seen that the structure of the IVJV has been largely put into effect and an approximation made of the automobile industry paradigm, though not in the way originally envisaged. Rather than MG Rover remaining in existence as an independent part of the IVJV, the company collapsed, with the IVJV style of structure and benefits being largely effected by both SAIC and NAC. This has resulted in a full-function structure but one that continues to recognise the benefits of endowment differentiation and the maintaining of a division between human and physical assets.

8: Conclusions

So, the purpose of this thesis has been to construct a conceptual framework for the automobile industry and thereby provide a systematic perspective on the organisational size and structure of companies that operate within it. In this thesis the resultant model is known as the automobile industry paradigm and it describes the conceptual limits of an automobile firm in terms of its most efficient size and structure. This research was built on a theoretical framework supported by evidence relating to the contextual automobile industry with the UK's only mass market automobile manufacturer, MG Rover, as a specific case study. As a qualitative problem the data was gathered from contemporary literature and in semi-structured elite interviews with senior actors within the industry. This permitted comparisons between MG Rover and the contextual companies at each point as the paradigm was developed in this thesis.

The automobile industry paradigm was constructed from two distinct perspectives: the first concerning economies of scale, based on the assumption of a common technology (see Chapter 4), the second concerning organisational structure, based on transaction cost analysis (see Chapter 5). In separating these concepts the thesis was able to isolate factors relevant to firm size from those relevant to firm structure. It was then possible to estimate the minimum size and structure for a sustainable automobile manufacturer, known in this thesis as a prototypical automobile company. Such a company should attain minimum efficient scale, or MES_P for a prototypical company, and minimum organisational structure, these being the four functions (R&D, Powertrain, BIW and Final Assembly) of the full-function model. The purpose of this chapter is not to reiterate the conclusions that were drawn at the end of each section of the thesis but to discuss the overall meaning of the research for understanding the current state of the industry. This will lead into discussions on how the industry is likely to develop, implications for national government policy, lessons that may be applied in other industries and suggestions for continuation of this research.

8.1 Current state of the industry

In order to quantify the importance of scale in the automobile industry the research took two perspectives: the first, using survivor analysis, looked at the growth of market share for selected output ranges and the second calculated MES_P from the estimates of minimum plant sizes, MEPS. The first approach was rather inconclusive since even over a thirty year period there were only indications that the largest output ranges were continually expanding, it was not possible to determine how much further this output share would grow. At the same time, survivor analysis showed a second trend in the output ranges below 1m units a year. Although the output share was falling, there were manufacturers within this trend that were holding on tenaciously, even expanding, even if at their rates of growth it could be a decade before they rose into the next output category. Survivor analysis therefore indicated two types of firm, the industry leaders with output above 2.5m, and then a select number of smaller firms that seemed to survive at some minimum sustainable level.

The reason for the survivor analysis not being conclusive is that markets in emerging economies such as China and India are driving automobile sales rapidly higher and so market shares are still evolving. The alternative approach, calculating MES_P from MEPS for each function, was conclusive but resulted in a remarkably low output figure. This was particularly the case with R&D, for which the accepted view is that it can cost up to one billion pounds for a new model programme, yet this research found that the continuing costs of R&D could be as low as £250m a year. This figure was derived from the latest DTI data from on Subaru (the automobile division of Fuji Heavy Industries), and even if the average figure over a four-year period is taken (2002-2006) this only rises to £287.5m, with a peak figure of £313.3m in 2003/4. Furthermore, the 2006 DTI data for Proton in Malaysia, the only year available, showed R&D investment as low as £53.5m (DTI, 2006), albeit with significant external assistance and a smaller model range.

The relatively low scale necessary for MES_P is symptomatic of the fundamental state of the industry. Since the production technology has been well established for the past few decades, at least since Toyota's TPS system refined manufacturing techniques in the 1970s, then the industry would be expected to have reached a mature stage in its

life cycle. This would imply that the basic specification of the products should be fairly standardised, profit levels expected to have fallen and there would be less product innovation. The strategy for these firms, then, would be to reduce R&D and production costs to a minimum and defend market share through product differentiation, perhaps in market niches. This appears to be Subaru's position with a limited number of vehicle platforms underpinning a narrowly defined product range targeted at market niches (principally four-wheel-drive). The strategy is reflected in the financial results, Subaru showing a net margin of 2.3% for 2007, not as high as Toyota with 6.8% but still ahead of Mazda with a net margin of 1.8% and Daihatsu with 1.4% (all figures courtesy of Global Insight). Without closely analysing the different measures of financial returns it would seem, then, that operating close to MES_P does not result in high profits but at least the business is generating an acceptable return.

The problem for a prototypical company is in maintaining output of MES_P in an environment of regular models changes. On occasion the failure of one product can bring the company down, the NSU Ro80 being a good example. Joint ventures can help, a scale alliance providing access to a production facility that has achieved MEPS but without the obligation of filling the capacity alone. Link alliances provide similar access to shared technical innovations but, as this research has demonstrated, there are risks of *ex post* opportunism and so these alliances tend to be short lived. The strategy is also open to the industry leaders and they tend to engage in them on a project-by-project basis in order to spread the risk of opportunism.

Although MES_P represents the minimum cost for the industry it is difficult to stabilise output at this level so the alternative strategy is to expand output in order to diversify the risk in output variation. The industry leaders have thereby reduced actual production costs as low as possible by having output at multiples of MES_P. An extensive model range combined with global markets and flexible production mean that larger companies have proportionately more stable output. For an industry leader to suffer rising costs due to output variation of the same magnitude as a prototypical firm it would have to be inflicted by a multiple demand failure, a statistically less likely occurrence given the breadth of the model range. Nevertheless, it is a predicament that has impacted most recently on Ford, resulting in the closure of

multiple plants. Interestingly, the output quantity for MES_P suggests that Ford could retrench to its domestic market after divesting itself of Jaguar and Land Rover and restore its fortunes in the market as a priority. Ford could particularly exploit local advantage based on its understanding of US buying habits (e.g. US consumer preference for SUVs).

For automobile manufacturers that are operating well below MES_P their first task would be to raise output to the threshold level. This thesis found that MG Rover was in this disadvantaged output range and suggested that an IVJV would have created a division in the full-function structure that avoided *ex post* opportunism by returning all the benefits of a new development to the partner responsible for the function. Opportunism would therefore be expressed as innovation and of greatest benefit to the firm that developed it. Additional benefits can also come from international separation such that the contrasting factor endowments of different regions could be exploited to mutual benefit. It is therefore not simply a device for salvaging MG Rover's R&D capability but also a strategy for raising an assembly partner to a competitive position by providing immediate access to current product designs.

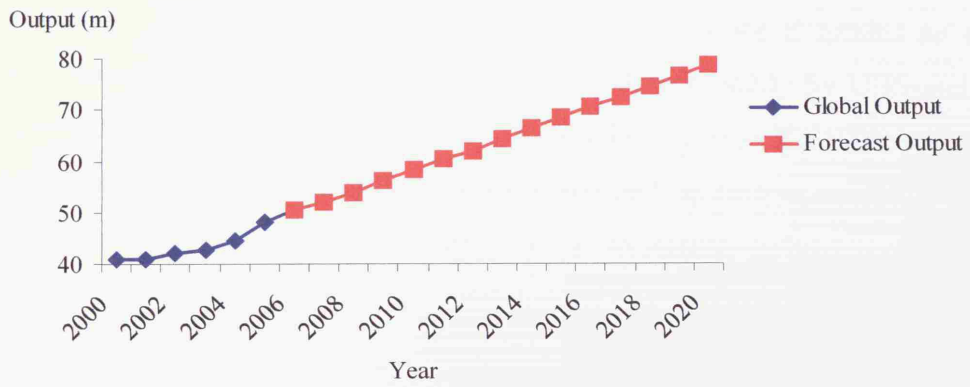
The weakness with the IVJV organisational structure was in formulating an appropriate governance structure. Although this research had found little support for the M-Form of multidivisional control, instead concluding that modern production systems favour the more centralised U-Form of governance structure that binds operational and strategic concerns together, the IVJV is founded upon a clear operational separation of functions. SAIC, and to a lesser extent NAC, partially replicated the IVJV structure with the R&D human assets of MG Rover but internalised the function even while permitting it operational control. This resurrects the M-Form with the specific purpose of exploiting the local factor endowments, specifically the engineering resources available in the UK. In accordance with M-Form of governance structure, strategic control is separated and resides with SAIC. The problem for this research is that this does not indicate where strategic control would have resided in a true IVJV between independent partners. This is particularly relevant for automobile companies where R&D and strategy are closely tied. A possible answer may be found in the kind of loose conglomerations exhibited by Japanese keiretsu groups where cooperative relationships are secured by equity cross-

holdings. A governance structure appropriate to an IVJV is therefore an area where a continuation of this research could usefully be focused.

8.2 Paradigm revolution for the automobile industry

Forecasts by Automotive News and by Global Insight, the automotive industry analysis company, suggest that total global automobile output could grow to 60m units by 2011. Figure 8.1 draws on three sets of data, two of which are concerned with forecasting. Actual output data from OICA is given for 2000 to 2006. The forecast data for 2007 to 2012 is simply an average of the forecasts from Automotive News and Global Insight. Finally, the trend from this average forecast is extended from 2013 until 2020.

Figure 8.1 Automobile production output and forecast 2000-2020



Sources: OICA, Automotive News, Global Insight

Figure 8.1 indicates that global production could reach 79m units by 2020, and according to World Business Council for Sustainable Development (WBCSD)(2004) the Chinese passenger car market will rival that of the United States by 2030, although forecasts concerning the Chinese market often underestimate the growth in demand. In any case, such forecasts may become obsolete if the automobile industry paradigm should undergo a revolutionary paradigm shift due to radical changes in the underlying technical considerations, as foreshadowed in some of the following developments.

The observation that the industry leaders are making greater commitments to R&D was one of the more interesting results of this research. It was expected that R&D costs would have been lower for larger firms since an increased number of model variants suggested that R&D per vehicle would have been less. Instead, the industry leaders were spending more per model. The fieldwork data had a valuable contribution to make here, particularly at Honda, where interviewees discussed at great length projects such as jet engine design, robotics and fuel cell research. While the interviewees attempted to justify these programmes, even with a degree of validity, it should be emphasised that these new technologies are not relevant to the current automobile paradigm.

Research that is being conducted on new technologies represents the next paradigm for the industry. As far as vehicle motive power is concerned, it is well known that oil is both a limited resource and a source of environmentally harmful exhaust emissions. Hybrid technology, which combines an internal combustion engine with an electric generator, is often cited as an interim technology but since it retains an orthodox engine it is adding cost to the production process. A joint study by UBS and Ricardo Consulting found that a hybrid powertrain, as fitted to a Lexus RX400h, was twice the cost of an equivalent fully compliant clean diesel and up to five times the cost of an equivalent petrol engine (UBS/Ricardo, 2007). In effect, hybrid technology adds another function to the full-function model, that of electric powertrain.

A new paradigm for the industry would involve a distinctly new technology. Fuel cell technology may be this technology because it not only changes the fuel but also the production system. Whereas a traditional engine is a bulky device that can only be positioned in a limited number of ways within a vehicle, generally at the front or the back, a fuel cell system can be positioned with more flexibility. While the fuel cell stack at the heart of the system can be placed where the engine was customarily located, the ancillary components, such as batteries, can be distributed throughout the vehicle platform. GM designed the AUTOnomy concept as a chassis that contained all the elements of a fuel cell system, allowing the body design to be entirely separate (Nash, 2002). Like the craft system of automobile production in the early years of the industry this concept means that the vehicle body is not the main load-bearing structure so there is greater flexibility in body design and use of materials. This in turn

makes the BIW process of the Budd Paradigm redundant with subsequent implications for economies of scale in the industry.

Fuel cell technology is still at the experimental stage and it is not known when, or even whether, it will reach mass production and what the costs of production will be. Some manufacturers, such as Mercedes-Benz, suggest that production fuel cell vehicles could be introduced by 2010 but these technology demonstrators will be intended to test the market. Furthermore, there is no significant hydrogen fuel infrastructure in place and according to Fuel Cells 2000 (Fuel Cells 2000, 2007) there is just one fuel station in the UK. This may mean that the first fuel cell applications will be commercial vehicles with centralised fuel supply, and that personal vehicles will be supplied from their own domestic hydrogen producing devices. There is also the possibility that fuel cell vehicles will produce their own hydrogen from other fuel sources carried on board.

Since the future of fuel cell technology is unknown there is no way of telling if the research strategies of the automobile industry leaders are the appropriate ones. If it transpires that economies of scale for fuel cells are very high, particularly in view of the capital intensive nature of production, or that consumers consider them to be a generic product, then automobile manufacturers might find that they need to restructure their hitherto full-function integrated structures. It is feasible that some manufacturers might even specialise in the production of fuel cells and relinquish their vehicle production facilities. Alternatively, vehicle manufacturers may relinquish powertrain production in favour of a specialised supply industry. If this were the case, and GM's AUTOnomy concept became the industry standard, then automobile firms could manufacture generic vehicles chassis in a central location and ship them to small, final assembly plants that served their local markets in the style of micro factory retailing (Nieuwenhuis and Wells, 2003). This, of course, would only be economically feasible if body production was suitably adapted to a new MEPS.

The uncertainty surrounding the possible paradigm revolution means that automobile firms that are currently operating at or near MES_P will not necessarily suffer a disadvantage. Indeed, should MEPS for any given function be significantly reduced, particularly for body production, then these manufacturers may be as well placed as

any larger manufacturer. Furthermore, if it transpires that fuel cell technology is not suitable for personal vehicles then it may be that the current paradigm will continue but using a different fuel source. This would represent a paradigm shift if it was due to some evolution in the technical basis of the paradigm. One innovation that would make this possible is if hydrogen was consumed within an internal combustion engine in place of oil based fuel. Although BMW developed the first hydrogen fuelled car, the 750hL in 2000 (BMW, 2007), using a conventional engine, Mazda's rotary engine technology is more suited to the consumption of hydrogen fuel (Yamaguchi, 2003). A switch in the industry to production of rotary engines might require an adjustment in the production technology that shifted the present paradigm, although not enough to herald an entirely new paradigm.

8.3 Implications for national policy

This research has found that globalisation was not an ultimate state but was a continuing process of related development between distinct geographic regions based on their factor endowment differentiation. A narrow view of factor endowment differentiation would suggest that globalisation would eventually lead to a homogenous global industry. A broader view, though, as espoused by Schott (2003) shows that factor endowment differences are fundamentally constant and so globalisation is a dynamic process as regions continue to develop their specific advantages.

Automobile industry leading companies have tended to ignore the opportunities offered by globalisation because they find greater advantage in their centrally controlled internal markets. This has resulted in industry leaders taking a strategic view of opportunities, locating plants as part of an overall global plan rather than to exploit specific local advantages. It is something of an irony that Japanese automobile firms have selected the UK for production plants when the UK's comparative advantage is in engineering rather than labour intensive assembly work. Since the rationale behind the plants is strategic they may be moved to other locations should the strategy require it. Ford's conversion of the Dagenham final assembly plant into a centre of excellence for diesel engines is an example of this, consequently all Ford

branded cars are now imported into the UK, principally from assembly plants elsewhere in Europe.

Dunning (1979) suggested that factor endowments can be developed further by investment in facilities and workforce training. Given that the definition of any forthcoming paradigm revolution in the automobile industry is replete with uncertainty it could be argued that research outside of the current paradigm should be the preserve of national governments. This would then create a bedrock of capability that manufacturers could draw on by cooperating in specific programmes or recruiting staff that have experience of the latest developments. Government research would thereby provide knock-on benefits for the national economy in a similar manner to defence programmes or space research.

There is nothing new in this suggestion and governments have at times become involved in company operations at times of crisis, but with only sporadic success rates. Indeed, MG Rover and its predecessors were subject to government involvement in more ways than perhaps any other company in the industry. Part of the reason for MG Rover's ultimate demise was that the UK government could not, and would not, rescue it again. This is not, though, what the development of factor endowment should entail. If the skills that were prevalent within MG Rover have been redeployed elsewhere in the economy to greater net benefit then the government was wise not to intercede in the company's fate. Government policy should instead be directed at ensuring these fundamental capabilities are progressively enhanced.

Of course, there is no certainty that a government is more effective at identifying which factor endowments to support than it is at identifying which companies to rescue and the fieldwork interviews found little gratitude in the industry for government involvement so far. For example, Mr Oldaker of MG Rover registered his disappointment with the quality of graduates emerging from British universities. National pride can also cause obstructions, the Chinese government promoting the development of R&D capability in the domestic automobile industry even though the nation's comparative advantage lies in production. If the myriad of new Chinese car manufacturers are found to lack R&D capabilities with which to compete against the global industry leaders then they will fail to reach MES_P and will require continuing

government support, or else they will leave the industry. Instead, the Chinese government should enhance the nation's underlying production capabilities so that it retains its current production advantages. This can be achieved by embracing the IVJV concept that allows direct access to R&D capabilities elsewhere in the world. The mechanism for this is free trade, allowing companies to seek out resources in an open market. The role of the government, then, is to provide a secure legal framework for companies in a free trade environment with a pool of fundamental resources to draw on.

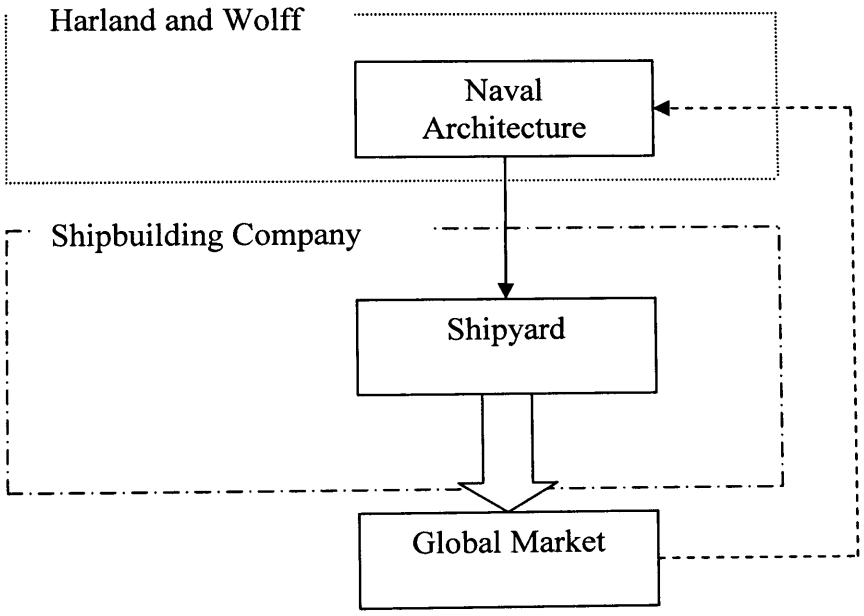
8.4 Applicability to other industries

The IVJV strategy is only suitable in exceptional circumstances. For a sub-optimal firm to exist at all suggests some form of support, perhaps through government subsidies, company cross-subsidies or consumption of internal company resources. When two companies are suboptimal to the relevant industry paradigm in complementary ways there is the potential for them to form an alliance that allows them to take sole responsibility for their strengths but relinquish their weaknesses to their partner. Furthermore, they should be located in regions with contrasting factor endowments so that they can exploit the related comparative advantages. The final result, in order to replicate to their industry paradigm, should be an industry standard set of functions (i.e. full-function) and output that is competitively close to the MES for the industry.

The ship building industry might have potential in this way. At one time shipbuilding was a major industry in the UK and the country retains many of the skills relevant to naval architecture. For example, Harland and Wolff in Belfast designed and built such famous craft as The Titanic. While the company has a ship repair facility it no longer builds ships, although it continues to the ship design capability (Harland and Wolff, 2007) that would permit it to link with a shipyard elsewhere in the world. To illustrate this, Figure 8.2 shows an IVJV between Harland and Wolff and an overseas shipyard in an emerging economy to exploit low costs in production. As in the automobile IVJV, the market intelligence would return to the company that initiated the product, Harland and Wolff. Interdependency would be created by the Harland and Wolff's need to have access to a shipyard while the shipbuilder would need to have a supply

of ship designs. The interdependency obviates the necessity for rigid, exclusive contracts and it is likely that both could pursue their own strategies and therefore their own separate governance structures. A similar relationship seems to be evolving between Carnival Corporate Shipbuilding, designers of the Cunard cruise liners, and the Italian shipyard, Fincantieri. For a complete IVJV, Fincantieri would have to relinquish all cruise line design to Carnival Corporate Shipbuilding. Other industries that might be amenable to similar division are the aircraft and shipbuilding industries, each having an R&D capability that can be readily separated from production.

Figure 8.2 Proposed IVJV between Harland and Wolff and a shipbuilding company



The armaments industry might present political problems, however, it being important to balance the cost advantages of foreign production with the need to maintain a strategic manufacturing facility in the home market. For this reason, countries strive to be self-sufficient in the defence industry. This may be counterproductive: just as IVJV alliances need an enlightened approach by national governments in recognising that there is mutual benefit in promoting cross-border dependency, so similar cooperation in the defence industry may actually reduce the need for it.

8.5 Suggestions for subsequent research

Perhaps one of the most surprising discoveries of this research was the relatively low quantities for MES_P. This was based on a calculation from the MEPS for each function, but empirical support was found in the companies that produce near this level. Subaru was often cited in this thesis, but AvtoVAZ is not much larger and they will soon be joined by Chrysler and Mercedes-Benz, fresh from their demerger. Below these manufacturers there are, of course, numerous Chinese manufacturers all attempting to reach sustainability during the period that they are protected under Chinese law. Once the Chinese market is fully liberalised then the domestic manufacturers will be exposed to the global industry. There is therefore a sense of urgency for them in achieving MES_P before the government support falls away. For this reason it is important for other studies to provide support for the measure of MES_P found by this thesis.

This thesis has attempted to provide a cogent argument for IVJVs but there has been, so far, little empirical evidence of them occurring in their pure form. There do seem to be suggestions of the IVJV structure in other alliances, such as Rootes Group and Iran Khodro, but this research did not find any such relationships in the definitive form. This is partly because they are only possible in exceptional circumstances, but also because there is political resistance to cross-border interdependencies, particularly in key industries such as this. It might therefore be advisable to study cross-border alliances between countries that are politically close.

Another reason why the IVJV has been slow in emerging is related to the particular problem for this thesis in formulating an appropriate governance structure for the IVJV. In discussing various governance structures (see 5.1.9 above) the research found little empirical support for the M-Form yet there may be some possibility that it would be suited to the IVJV in recognition of the clear separation of operational functions. This then leaves the problem of strategic control. According to interviewees at MG Rover, however, automobile markets are similar enough to accept common vehicle designs. Evidence for this can be seen in the way that SAIC and NAC put the Rover 75/MG ZT into production in China with few changes, apart from a slight increase in rear passenger space. Equally, conducting R&D in the intended

market may not necessarily result in increased sales, the Honda Ridgeline truck being designed in the US but capturing relatively few sales. This suggests that it may be possible to leave R&D strategy with the R&D partner since they are as well placed as any to judge the needs of the market.

8.5 Closing remarks

This research originally set out to demonstrate that MG Rover represented a viable proposition as a self-sustaining automobile manufacturer. Many critics believed that this was a hopeless task given the apparent general trend in the industry towards consolidation. This thesis has shown that its planned level of production was well short of that necessary to reach the industry standard of MES_P, but not by the order of magnitude that had been suggested. Furthermore, the company was in the process of arranging an IVJV that this research has suggested held great promise. Ultimately, however, events conspired against the company. Nevertheless, the purchase of MG Rover's assets by two ambitious Chinese automobile manufacturers shows that there was value in MG Rover and that the successors to the company have the potential to make a contribution to the global automobile industry far beyond the remit of the original operation at Longbridge.

References

ACEA (2007) Automotive Production (EU + EFTA Countries) Summary 2006. ACEA, 10 May 2007, accessed 16 July 2007, website <www.acea.be/files/PRODUCTION%202006.pdf>

Adeney M (1988) The motor makers: the turbulent history of Britain's car industry. London: Collins

Altman M (1999) The methodology of economics and the survival principle revisited and revised: some welfare and public policy implications of modeling the economic agent in *Review of Social Economy Vol. 57, No. 4, pp.427-449*

Altshuler A, Anderson M, Jones D, Roos D and Womak J (1986) The future of the automobile: the report of MIT's International Automobile Program. Cambridge MA: MIT Press

Almor T, Hashai N and Hirsch S (2006) The product cycle revisited: Knowledge intensity and firm internationalization in *Management International Review, Vol.46, No.5, September 2006, pp. 507-626*

Álvarez Gil M J and González de la Fé P (1999) Strategic alliances, organisational learning and new product development: the cases of Rover and Seat in *R&D Management, Volume 29, Number 4, October 1999, pp. 423-426*

Amicus (2004) Motor vehicles fact sheet, May 2004, released by Amicus: London

Anastakis D (2004) From independence to integration: the corporate evolution of the Ford Motor Company of Canada, 1904-2004 in *Business History Review 78 (Summer 2004) pp 213-253*

Andersen O (1993) On the internationalization process of firms: a critical analysis in *Journal of International Business Studies, 1993 24 (2) p209*

Ankarloo D and Palermo G (2004) Anti-Williamson: a Marxian critique of New Institutional Economics in *Cambridge Journal of Economics 2004, 28, pp413-429*

Antràs P (2005) Incomplete contracts and the product cycle in *American Economic Review, September 2005, Vol. 95, No. 4, pp.1054-1073*

Armour H O and Teece D J (1980) Vertical integration and technological innovation in *The Review of Economics and Statistics, August 1980, Vol.62, No.3, pp.470-474*

Armour H O and Teece D J (1978) Organizational structure and economic performance: a test of the multidivisional hypothesis in *The Bell Journal of Economics, Vol.9, No.1 (Spring, 1978), pp.106-122*

Artz K W and Brush T H (2000) Asset specificity, uncertainty and relational norms: an examination of coordination costs in collaborative strategic alliances in *Journal of Economic Behaviour and Organization, Vol.41, 2000, pp.337-362*

Assembly (2002) Then and now: the mechanical marvel in *Assembly, 1 February 2002,* accessed March 2002, website <http://www.assemblymag.com/CDA/ArticleInformation/features/BNP__Features__Item/0,6493,98331,00.html>

Autocar (2001) New car prices in *Autocar, 12 December 2001*

Autocar (2005) How £100m could save MG in *Autocar, 19 April 2005, pp.46-49*

Automotive Design and Production (2004) Nissan: how to achieve shift from website Automotive Design and Production July 2004, accessed 14 September 2006, website < http://www.autofieldguide.com/articles/070401.html>

Automotive Engineer (2004) In the right mind in *Automotive Engineer, January 2004, pp.60-61*

Automotive Engineer (2004b) Rover seeks Proton alliance in survival battle in *Automotive Engineer, March 2004, pp.4-5*

Automotive News (2000) New Rover Cars owner ponders possible partners in *Automotive News, 15 May 2000, 74, 5874, p42*

Automotive News (2001) MG Rover brings suppliers to Longbridge in *Automotive News, 29 January 2001, p.40*

Automotive News (2004) Mitsubishi crisis is round 2 for Gilligan in *Automotive News 2 August 2004 p24*

Automotive News (2004a) 2004 Market Data Book in *Automotive News supplement, 28 June 2004*

Automotive News (2004d) Guide to global automotive partnerships in *Automotive News, supplement, 4 October 2004*

Automotive News (2005f) 2005 Market Data Book in *Automotive News supplement, 23 May 2005*

Automotive News (2005h) Asian's new R&D Taj Mahals are a sign of success in *Automotive News, 16 May 2005 p1*

Automotive News (2005i) Subaru plan finally has one mission in *Automotive News, 13 June 2005 p24*

Automotive News (2005j) Guide to global automotive partnerships in *Automotive News, supplement, August 2005*

Automotive News Europe (2006) 2006 Market Data Book in *Automotive News supplement, May 2006*

Automotive News (2006a) 2006 Market Data Book in *Automotive News supplement, 22 May 2006*

Automotive News (2006b) 2006 Global Market Data Book in *Automotive News supplement, 26 June 2006*

Automotive News (2006c) 2006 Guide to China's Auto Market in *Automotive News, supplement, 1 May 2006*

Automotive News (2006d) Magna Steyr: big changes needed to be competitive in *Automotive News, 14 August 2006*

Automotive News (2007) Even sold, Aston works with Ford from *Automotive News, 19 March 2007*

Automotive News (2007a) 2007 Global Market Data Book in *Automotive News supplement, 25 June 2007*

Automotive News (2007b) 2007 Guide to China's Auto Market in *Automotive News, supplement, 14 May 2007*

Automotive News (2007c) Hyundai halts production at Alabama plant in *Automotive News, 5 October 2007*

AutoTech Daily (2002) GM touts flexible body shop tooling from *AutoTech Daily, 16 December 2002, p.1*

Autoweek (1999) What Morgan for the millennium? from *Autoweek, 1 November 1999*, website accessed 23 August 2006
<http://www.gomog.com/articles/autoweek.html>

Aw B-Y and Batra G (1998) Firm size and the pattern of diversification in *International Journal of Industrial Organization, Vol.16, pp.313-331*

AWKnowledge (2003) Capacity utilisation data. August/September 2003

Bailey D, Sugden R and Harte G (1994) Making Transnationals Accountable: a significant step for Britain. London: Routledge
Bailey D (2003) Globalisation, regions and cluster policies: the case of the Rover Task Force in *Policy Studies, Vol.24, Nos.2/3, 2003, pp.67-85*

Bailey D (2007) Globalization and restructuring in the auto industry: the impact on the West Midlands automobile cluster in *Strategic Change, Vol.16, pp.137-144*

Barkema H G, Bell J H J and Pennings J M (1996) Foreign entry, cultural barriers and learning in *Strategic Management Journal, Vol. 17(2) pp 151-166*

Barnet R J and Mueller R E (1974) Global Reach: The Power of the Multinational Corporations. New York: Simon & Schuster

Bartlett C A and Ghoshal S (1993) Beyond the M-Form: toward a managerial theory of the firm in *Strategic Management Journal, Vol.14, pp.23-46*

Beamish P W and Makino S (1998) Performance and survival of joint ventures with non-conventional ownership structures in *Journal of International Business Studies, Vol. 29, pp. 797-*818

Bell J, McNaughton R and Young S (2001) 'Born again' global firms: an extension to the 'born global' phenomenon in *Journal of International Management, 7, 3, pp1-17. 2001*

Benady D/TGWU (2003) Jobs relocation: a one-way street? TGWU publication, issued 1 December 2003, accessed 5 April 2005, TGWU website <http://www.tgwu.org.uk/Templates/Journal.asp?NodeID=90352>

Benson J K (1983) A dialectical method for the study of organisations in Morgan G (ed.)(1983) *Beyond method: strategies for social research.* Beverly Hills, CA: Sage

Berger S (2000) Globalization and politics. MIT IPC Globalization Working Paper 00-005, in *Annual Review of Political Science (2002) Vol.3 pp 43-62*

Beynon H (1984) Working for Ford. Harmondsworth: Pelican

Bhaskar (1979) The future of the UK motor industry. London: Kogan Page

Blois K J (1972) Vertical quasi-integration in *The Journal of Industrial Economics, Vol.20, No.3, July 1972, pp.253-272*

BMW (2007) Company Facts – Sustainability and the Environment from company website, accessed 13 October 2007, <http://www.bmweducation.co.uk/default.asp>

Borensztein E, De Gregorio J and Lee J-W (1998) How does foreign direct investment affect economic growth? in *Journal of International Economics, Vol.45, pp.115-135*

Brady C and Lorenz A (2001) End of the Road: BMW and Rover – a brand too far. London: Pearson Education Ltd

Brannen P (1987) Working on directors: some methodological issues in Moyser and Wagstaff (eds.)(1987) Research methods for elite studies. London: Allen and Unwin

British Psychological Society (1992) Ethical principles for conducting research with human participants from British Psychological Society, accessed 1 November 2006, website <http://www.bps.org.uk/the-society/ethics-rules-charter-code-of-conduct/code-of-conduct/ethical-principles-for-conducting-research-with-human-participants.cfm>

Bryman A (2001) Social research methods. Oxford: Oxford University Press

Bryman R (1989) Research methods and organization studies. London: Routledge

Buckley M and Rees C (2002) The World Encyclopaedia of Cars: The Definitive Guide to Classic and Contemporary Cars from 1945 to the Present Day. London: Hermes House

Buckley P J (1990) Problems and developments in the core theory of international business in *Journal of International Business Studies, Q4 1990, Vol.21, Iss.4, pp.657-665*

Buckley P J (2002) Is the international research agenda running out of steam? from *Journal of International Business Studies, Vol.33, No.2, Q2 2002, pp.365-373*

Buckley P J and Casson M (1976) The future of the multinational enterprise. London: MacMillan press

Buckley P J and Casson M (1981) The optimal timing of a foreign direct investment in *The Economic Journal, Vol.91, No.361, March 1981, pp.75-87*

Buckley P J and Casson M (1998) Models of the multinational enterprise in *Journal of International Business Studies, Vol.29, No.1, Q1 1998, pp.21-44*

Buckley P J and Casson M C (1998b) Analyzing foreign market entry strategies: extending the internalization approach in *Journal of International Business Studies, Q3 1998, Vol.29, No.3*

Buckley P J and Ghauri P N (2004) Globalisation, economic geography and the strategy of multinational enterprises in *Journal of International Business Studies, 2004, Vol.35, pp.81-98*

Burton R B and Obel B (1980) A computer simulation test of the M-Form hypothesis in *Administrative Science Quarterly, Vol. 25, No. 3, September 1980, pp. 457-466*

Business Week (2000) Unloading Rover may not win the race in *Business Week, April 3, 2000, p.59*

Business Week (2007) China's Auto Industry: Roaring ahead in *Business Week, 2 May 2007*

Cabral L M B (2000) Introduction to industrial organization. Cambridge, MA: MIT Press

Cairncross A (1966) Introduction to economics. London: Butterworths

Calvet A L (1981) A synthesis of foreign direct investment theories and theories of the multinational firm in *Journal of International Business Studies, Spring 1981, Vol.12, pp.43-59*

Cantner U, Dreßler K and Kruger J J (2006) Firm survival in the German automobile industry in *Empirica (2006) Vol.33, pp.49–60*

Carr C (1993) Global, national and resource-based strategies: an examination of strategic choice and performance in the vehicle components industry in *Strategic Management Journal, Vol. 14, No. 7, October 1993, pp. 551-567*

Carr C (1999) Globalisation, strategic alliances, acquisitions and technology transfer. Lessons from ICL/Fujitsu and Rover/Honda and BMW in *R&D Management, Vol.29, Iss.4, 1999, pp.405-421*

Caves R E (1996) Multinational enterprise and economic analysis. Cambridge: Cambridge University Press

Central Policy Review Staff (1975) The future of the British car industry: a report. London: Her Majesty's Stationery Office

Chalmers A F (1983) What is this thing called science? Milton Keynes: Open University Press

Chase J (1995) Historical analysis in psychological research in Breakwell G M, Hammond S and Fife-Schaw C (eds.)(1995) Research methods in psychology. London: Sage Publications

Chandler (1977) The visible hand: the managerial revolution in American Business. London: Harvard Universty Press

Chandler A D (1990) Strategy and structure: chapters in the history of the American industrial enterprise. Cambridge, MA: MIT Press

Change S J and Choi U (1988) Strategy, structure and performance of Korean business groups: a transactions cost approach in *The Journal of Industrial Economics, Vol.37, No.2, December 1988, pp.141-158*

Cheng L K and Kwan Y K (2000) What are the determinants of the location of foreign direct investment? The Chinese experience in *Journal of International Economics, Vol.51, pp.379-400*

Chery (2007) Chery Engine Company from Chery website, accessed 9 August 2007, website <http://www.cheryacteco.com/en/index.jsp>

Church R (1979) Herbert Austin: the British motor car industry to 1941. London: Europa

Church R (1994) The rise and decline of the British motor industry. London: Macmillan

Clark K B, Chew W B, T Fujimoto, Meyer J and Scherer F M (1987) Product development in the world auto industry in *Brookings Papers on Economic Activity, Vol. 1987 No.3, Special Issue on Microeconomics, pp.729-781*

Clarke R (1987) Conglomerate firms in Clarke R and Mc Guiness A (1987)(eds.) The economics of the firm. Oxford: Basil Blackwell

Cleeve E (1997) The motives for joint ventures: a transaction cost analysis of Japanese MNEs in the UK in *Scottish Journal of Political Economy, February 1997, Vol.44, No.1, pp31-43*

Coase R H (2000) The acquisition of Fisher Body by General Motors in *Journal of Law and Economics 43 (2000) pp15-31*

Coles J W and Hesterly W S (1998) Transaction costs, quality, and economies of scale: examining contracting choices in the hospital industry in *Journal of Corporate Finance 4 (1998) pp 321-345*

Collins P and Stratton M (1993) British car factories from 1896: a complete historical, geographical, architectural and technological survey. Godmanstone, Dorset: Veloce Publishing

Cooper A C (1964) R&D is more efficient in small companies in *Harvard Business Review, 42 (3) pp.75-83*

Corbetta P (2003) (translated by Bernard Patrick) Social research: theory, methods and techniques. London: Sage

Cowling K and Sugden R (1998) Strategic trade policy reconsidered: national rivalry vs free trade vs international cooperation in *Kyklos, Vol.51, Iss.3, pp.339-357*

Cowling K and Tomlinson P R (2005) Globalisation and corporate power in *Contributions to Political Economy, Vol. 24, pp.33–54*

Creswell J W (2003) Research design: qualitative, quantitative and mixed methods approaches. London: Sage

DaimlerChrysler (2004) An engineering odyssey: from all-steel to true unit bodies 1914-1960 from Walter P Chrysler Museum, accessed 7 April 2005, website: < http://www.chryslerheritage.com/sec500_pdf/An%20Engineering%20Odyssey.pdf>

Dankbaar B (1992) Economic crisis and institutional change: the crisis of Fordism from the perspective of the automobile industry. Maastricht: UPM

D'Aveni R A and Ravenscraft D J (1994) Economies of integration versus bureaucracy costs: does vertical integration improve performance? in *Academy of Management Journal, 1994, Vol.37, No.5, pp.1167-1206*

David R J and Han S-K (2004) A systematic assessment of the empirical support for transaction cost economics in *Strategic Management Journal, 2004, 25, pp.39-58*

Demizu T (2003) Honda: its technology and management. Osaka: Union Press

Denscombe M (1998) The good research guide: for small-scale social research projects. Buckingham: Open University Press

Denzin N K (1978) The research act: a theoretical introduction to sociological methods (2nd ed.). New York: McGraw-Hill

De Vaus D (2001) Research design in social research. London: Sage

Dexter L A (1970) Elite and specialised interviewing. Evanston IL: Northwestern University Press

Dey I (1993) Qualitative data analysis: a user-friendly guide for social scientists. London: Routledge

Dicken P (2003) Global shift: transforming the world economy. London: SAGE

Diesel Progress (1999) Peugeot Citroen and Ford sign diesel engine agreement in Diesel Progress, December 1999, website accessed 15 August 2007, website <http://findarticles.com/p/articles/mi_m0FZX/is_12_65/ai_58674994>

Donaldson L (2001) The Contingency Theory of Organizations. London: SAGE

Donnelly T, Morris D and Donnelly T (2005) Renault-Nissan: a marriage of necessity? in *European Business Review, Vol. 17, Iss. 5, pp.428 - 440*

Doz Y L and Prahalad C K (1991) Managing DMNCs: a search for a new paradigm in *Strategic Management Journal, Vol.12, pp.145-164*

Drucker P F (1972) Concept of the corporation. New York: John Day

DTI (2003) The 2003 R&D Scoreboard. London: HMSO

DTI (2004) The 2004 R&D Scoreboard. London: HMSO

DTI (2005) The 2005 R&D Scoreboard. London: HMSO

DTI (2006) The 2006 R&D Scoreboard. London: HMSO

DTI/Auto Industry (2007) Background information on MG Rover from Auto Industry website, accessed 8 February 2007 <http://www.autoindustry.co.uk/features/MG%20Rover/MG_Rover_Background>

Dunne P and Hughes A (1994) Age, size, growth and survival: UK companies in the 1980s in *The Journal of Industrial Economics, Vol.42, No.2, pp.115-140*

Dunning J H (1979) Explaining changing patterns of international production: in defence of the eclectic theory in *Oxford Bulletin of Economics and Statistics, Vol.41, Iss.4, pp.269-295*

Dunning J H (1980) Toward an eclectic theory of international production: some empirical tests in *Journal of International Business Studies, Spring 1980, Vol.11, pp.9-31*

Dunning J H (1981) International production and the multinational enterprise. London: George Allen and Unwin

Dunning J H (1995) Reappraising the eclectic paradigm in an age of alliance capitalism in *Journal of International Business Studies, 1995, Vol. 26, Issue 3, p461-491*

Dunning J H (2000) The eclectic paradigm as an envelope for economic and business theories of MNE activity in *International Business Review, 9, 2000, pp.163-190*

Dussauge P, Garrette B and Mitchell W (2004) Asymmetric performance: the market share impact of scale and link alliances in the global auto industry in *Strategic Management Journal, Vol.25, Iss.7, pp.701-711*

Dyer J H (1996) Does governance matter? Keiretsu alliances and asset specificity as sources of Japanese competitive advantage in *Organization Science, Vol.7, No.6, November-December 1996, pp.649-666*

Dyer J H (1997) Effective interfirm collaboration: how firs minimize transaction costs and maximise transaction value in *Strategic Management Journal, Vol.18, Iss.7, pp535-556*

Economist (2000) Walking away from Longbridge from *The Economist, 16 March 2000*

Economist (2002a) Special Report: Car Manufacturing in *The Economist, 23 February 2002*

Economist (2005) The global car industry: extinction of the predator in *The Economist, 8 September 2005*

Edwardes M (1983) Back from the brink: an apocalyptic experience. London: Collins

Erdener C and Shapiro D M (2005) The internationalisation of Chinese family enterprises and Dunning's eclectic MNE paradigm in *Management and Organization Review, Vol.1, No.3, pp.411-436*

Etemad H, Wright R W and Dana L P (2001) Symbiotic international business networks: collaboration between small and large firms in *Thunderbird International Business Review, Vol. 43 (4), pp481-499, July-August 2001*

Etter J-F and Perneger T V (2000) Snowball sampling by mail: application to a survey of smokers in the general population in *International Journal of Epidemiology, 2000, 29, pp.43-48*

Faugier J and Sargeant M (1997) Sampling hard to reach populations in *Journal of Advanced Nursing, 1997, 26 (4), pp.790-797*

Fech H E and Ginsberg P B (1974) Optimal scale in medical practice: a survivor analysis in *The Journal of Business, Vol. 47, No. 1, pp. 23-36*

Ferguson P R and Ferguson G J (2000) Organisations: a strategic perspective. Basingstoke: Macmillan Press

Feyerabend P (1993) Against Method. London: Verso

Fife-Schaw C (1995) Surveys and sampling issues in Breakwell G M, Hammond S and Fife-Schaw C (eds.)(1995) Research methods in psychology. London: Sage Publications

Financial Times (2001a) How Jensen got back on the road in *The Financial Times, 23 August 2001, p17*

Financial Times (2002) A driving ambition to do the impossible in *The Financial Times, 3 May 2002, p14*

The Financial Times (2002b) Defiant car maker sees a positive route to the future in *The Financial Times, 27 April 2002, p3*

Financial Times (2005g) MG Rover plans to recruit 200 engineers and development staff in *Financial Times, 1 March 2005, p2*

Fitz J and Halpin D (1995) 'Brief encounters: researching education policy-making in elite settings in Salisbury J and Delamont S (eds.)(1995) Qualitative Studies in Education. Aldershot: Avebury Ashgate Publishing

Flick U (2004) Triangulation in qualitative research in Flick U, von Kardoff E and Steinke I (eds.)(translated Jenner B) A companion to qualitative research. London: Sage

Ford (2004) Welcome to the home of the Ford Motor Company and our family of brands. Ford company website, accessed 6 November 2006 <http://www.ford.com/en/default.htm?source=topnav>

Ford (2006) Ford flexible engine production boosted by investment in Britain. Ford press release 06/098, 22 August 2006

Freeland R F (1996a) The Myth of the M-Form? Governance, Consent, and Organizational Change in *The American Journal of Sociology, Vol. 102, No. 2 September 1996, pp.483-526*

Frech H E and Mobley L R (1995) Resolving the impasse on hospital scale economies: a new approach *in Applied Economics, 1995, Vol.27, No.3, 286-296*

Freeland R F (1996b) The Struggle for Control of the Modern Corporation: Organizational Change at General Motors, 1924-1958 in *Business and Economic History, Vol. 25, No.1, Fall 1996*

Freeland R F (2000) Creating holdup through vertical integration: Fisher Body revisited in *Journal of Law and Economics, vol. 43, April 2000, pp.33-66*

Fuel Cells 2000 (2007) Online Fuel Cell Information Resource website, accessed 13 October 2007, <http://www.fuelcells.org/>

Fumia Design (2006) Lancia J: tribute to Lancia century from Fumia Design press release, October 2006, accessed 8th January 2007, website < http://www.fumiadesign.com/sel_news.html>

Galaskiewicz J (1987) The study of a business elite and corporate philanthropy in a United States metropolitan area in Moyser and Wagstaff (eds.)(1987) Research methods for elite studies. London: Allen and Unwin

Garrahan P and Stewart P (1991) Nothing new about Nissan? in Law C M (ed.) (1991) Restructuring the global automobile industry: national and regional impacts. London: Routledge

Gear Product News (2006) Cast gear blanks: what to consider when in *Gear Product News, June 2006 pp. 34-39*

Georgano N (2000) The Beaulieu encyclopaedia of the automobile. London: The Stationery Office

Gershwin S B (1987) An efficient decomposition method for the approximate evaluation of tandem queues with finite storage space and blocking in *Operations Research, Vol.35, No. 2, March-April 1987, pp.291-305*

Gilson R J and Roe M J (1993) Understanding the Japanese keiretsu: overlaps between corporate governance and industrial organization in *Yale Law Journal Vol. 102, No.4 (Jan 1993), pp.871-906*

Gorg H and Strobl E (2003) 'Footloose' multinationals in The Manchester School, Vol. 71, No. 1, pp.1-19

Grossman S J and Hart O D (1986) The costs and benefits of ownership: a theory of vertical and lateral integration in *Journal of Political Economy, 1986, Vol.94, No.4, pp.691-719*

Hagel J and Singer M (1999) Unbundling the corporation in *Harvard Business Review. March–April, pp.133–41*

Hakim C (1987) Research design. London: Allen Unwin

Hamel J with Dufour S and Fortin D (1991) Case study methods. London: Sage
Harrigan K R (1986) Matching vertical integration strategies to competitive situations in *Strategic Management Journal, 1986, Vol.7, pp.535-555*

Harland and Wolff (2007) Engineering Design Resources from company website, accessed 17 October 2007, < http://www.harland-wolff.com/facilities1.asp>

Hart O and Moore J (1990) Property rights and the nature of the firm in *Journal of Political Economy, 1990, Vol.98, No.6*

Harvey-Jones J with Masey A (1990) Trouble Shooter. London: BBC Books

Hedlund G (1994) A model of knowledge management and the N-form corporation in *Strategic Management Journal, Vol. 15, pp. 73-90*

Hennart J-F and Reddy S (1997) The choice between mergers/acquisitions and joint ventures: the case of Japanese investors in the United States in *Strategic Management Journal, 1997, Vol.18, pp.1-12*

Hill C W L (1985) Internal organization and enterprise performance: some UK evidence in *Managerial and Decision Economics, Vol.6, Iss.4, pp. 210-216*

Hill C W L (1988) Internal capital market controls and financial performance in multidivisional firms in *The Journal of Industrial Economics, Vol.37, No.1, September 1988, pp.67-83*

Hill C W L (2003) International business: competing in the global marketplace. Boston: McGraw-Hill

Hill C W L, Hwang P and Kim W C (1990) An eclectic theory of the choice of international entry mode in *Strategic Management Journal (1990) Vol. 11, pp117-128*

Ho Y C, Eyler M A and Chien T T (1983) A new approach to determine parameter sensitivities to transfer lines in *Management Science, Vol.29, No.6, June 1983, pp.700-714*

Holmstrom B and Milgrom P (1994) The firm as an incentive system in *The American Economic Review, September 1994, Vol.84, No.4*

Holweg M and Oliver N (2005) Who killed MG Rover? Special report from the Cambridge-MIT Institute's Centre for Competitiveness and Innovation, 25 April 2005

Honda (1999) A dynamic past, an exciting future. Tokyo: Honda

Honda (2002) 2002 FactBook. Tokyo: Honda

Honda (2004) Honda's US's automobile operations in *Honda Annual Report 2004, p.15*

Honda (2006) 2006 FactBook. Tokyo: Honda

Horaguchi H and Toyne B (1990) Setting the record straight: Hymer, internalization theory and transaction cost economics in *Journal of International Business Studies, Vol.21, Iss.3, pp.487-494*

Hoskisson R E, Hill C W L and Kim H (1993) The multidivisional structure: organizational fossil or source of value? in *Journal of Management, Vol.19, No.2, pp.269-298*

Hounshell D A (1984) From the American system to mass production, 1800-1932. London: Johns Hopkins University Press

Humphries A S and Wilding R D (2004) Long term collaborative business relationships: the impact of trust and C^3 behaviour in *Journal of Marketing Management 2004, Vol.20, pp.1107-1122*

Husan R (1997) The continuing importance of economies of scale in the automotive industry in *European Business Review, 1997, Vol.97, No.1*

Hymer S H (1960) The international operations of national firms, a study of direct foreign investment. PhD thesis, Massachusetts Institute of Technology

Hymer S (1970) The efficiency (contradictions) of multinational corporations in *The American Economic Review, Vol.60, No.2, pp.441-448*

Hymer S (1972) The internationalization of capital in *Journal of Economic Issues, March 1972, Vol.6, Iss.1, pp.91-111*

Hymer S and Pashigian P (1962) Turnover of firms as a measure of market behaviour in *The Review of Economics and Statistics, Vol. 44, No. 1, pp. 82-87*

Iran Khodro (2005) company website, Paykan history, accessed 20 June 2005, website <http://www.ikco.com/products/paykan.asp>

JAMA (2005a) Growing in America from JAMA website, accessed 30th August 2006, website: < http://www.jama.org/library/factsheets/Contributions_2005.pdf>

JAMA (2006) 2006: the motor industry of Japan. Tokyo: Japan Automobile Manufacturers Association

JAMA (2007) 2007: the motor industry of Japan. Tokyo: Japan Automobile Manufacturers Association

JAMA (2007b) Japan's motor vehicle statistics from JAMA website, accessed 24 September 2007, website <http://www.jama.org/statistics/index.htm>

Janesick V J (2000) The choreography of qualitative research design in Denzin N K and Lincoln Y S (eds.)(2000) Handbook of qualitative research (2nd ed.). London: Sage

Jick T D (1979) Mixing qualitative and quantitative methods: triangulation in action in *Administrative Science Quarterly, December 1979, Vol. 24, Issue 4, pp.602-611*

Johansen J and Vahlne J-E (1990) The mechanism of internationalisation in *International Marketing Review, Volume 7 Issue 4 pp11-24*

Jones J and Wren C (2006) Foreign direct investment and the regional economy. Aldershot: Ashgate Publishing

Joskow P L (1985) Vertical integration and long-term contracts: the case of coal-burning electric generating plants in *Journal of Law, Economics and Organization Vol. 1 (1) Fall 1985 pp33-80*

Joskow P L (2003) Vertical integration in Ménard C and Shirley M M (eds.) (2005) Handbook of new institutional economics. Cambridge, MA: Springer

Just-Auto (2004a) General Motors to relocate Asia-Pacific HQ to Shanghai and expand local design centre from Just-Auto, 23 June 2004, accessed 20 September 2006, website < http://just-auto.com/news_detail.asp?art=44815&dm=yes>

Just-Auto (2007) New chief at BMW engine plant from Just-Auto, 1 February 2007, accessed 1 February 2007, website < just-auto.com>

Kakabadse A and Kakabadse N (2000) Sourcing: new face to economies of scale and the emergence of new organizational forms in *Knowledge and Process Management, 2000, Vol.7, No.2, pp.107-118*

Kia (2007) Kia History from Kia website, accessed 9 August 2007, website <http://www.kiainfo.co.uk/about.htm#Kia%20History>

Kindleberger C P (1984) Multinational excursions. Cambridge, MA: MIT Press

Kitay J and Callus R (1998) The role and challenge of case study design in industrial relations research in Whitfield K and Strauss G (eds.) (1998) Researching the world of work: strategies and methods in studying industrial relations. Ithaca, NY: Cornell University Press

Klein B (1980) Transaction cost determinants of "unfair" contractual arrangements in *American Economic Review 1980 70 (May) pp356-362*

Klein B (1988) Vertical integration as organizational ownership: the Fisher Body-General Motors relationship revisited in *Journal of Law, Economics, and Organization, Vol.4, No.1, Spring 1988*

Klein B (2000) Fisher-General Motors and the nature of the firm in *Journal of Law and Economics 43 (2000) pp105-141*

Klein S, Frazier G L and Roth V J (1990) A transaction cost analysis model of channel integration in international markets in *Journal of Marketing Research, May 1990, Vol.27, pp.196-208*

Klepper S (1996) Entry, exit, growth, and innovation over the product life cycle in *The American Economic Review, Vol.86, No.3, pp.562-583*

Klepper S (2002) Firm survival and the evolution of oligopoly in *The RAND Journal of Economics, Vol. 33, No. 1, pp. 37-61*

Klepper S (2002b) The capabilities of new firms and the evolution of the U.S. automobile industry in *Industrial and Corporate Change, Vol.11, No.4, pp.645-666*

Kogut (1991) Joint ventures and the option to expand and acquire in *Management Science, Vol.37, No.1, January 1991, pp.19-33*

Kolodny H F (1979) Evolution to a matrix organisation in *Academy of Management Review, Vol.4, No.4, pp.543-553*

Koutsoyiannis A (1979) Modern microeconomics (2nd ed.). London: Macmillan

KPMG (2007) Momentum 2007 KPMG Global Auto Executive Survey from KPMG, website accessed 17 July 2007, website <http://www.kpmg.co.uk/pubs/ACFFCBC.pdf>

Krafcik J F (1988) Triumph of the lean production system in *Sloan Management Review Fall 1988, Vol. 30 (1) pp 41-52*

Kuemmerle W (1999) Foreign direct investment in industrial research in the pharmaceutical and electronics industries – results from a survey of multinational firms in *Research Policy, Vol.28, pp.179-193*

Kuhn T S (1970) The structure of scientific revolutions. London: University of Chicago Press

Lakatos I (1970) Methodology of scientific research programmes in Lakatos I and Musgrave A (ed.s)(1970) Criticism and the growth of knowledge. Cambridge: Cambridge University Press

Lamming R (1993) Beyond partnership: strategies for innovation and lean supply. London: Prentice Hall

Lee T W (1999) Using qualitative methods in organizational research. London: Sage

Leung M K, Young T and Digby D (2003) Explaining the profitability of foreign banks in Shanghai in *Managerial and Decision Economics, Vol.24, pp.15-24*

Levy D (1985) Transactions cost approach to vertical integration: an empirical examination in *The Review of Economics and Statistics, Vol. 67, No. 3 (Aug., 1985), pp. 438-445*

Lewchuck W (1987) American technology and the British vehicle industry: a century of production in Britain. Cambridge: Cambridge University Press

Lierberman M B (1991) Determinants of vertical integration: an empirical test in *The Journal of Industrial Economics, September 1991, Vol. 39, No.5*

Lord R G and Hohenfeld J A (1979) Longitudinal field assessment of equity effects on the performance of major league baseball players in *Journal of Applied Psychology, February 1979, Vol. 64, Iss.1, pp.19-26*

Lotus (2006) Lotus Engineering - The Total Solution Provider from Lotus Engineering website, accessed 1 September 2006, website <http://www.group lotus.com/generic/generic.php?section=17&page=21&page_id=21>

Lyons B R (1995) Specific investment, economies of scale, and the make-or-buy decision: a test of transaction cost theory in *Journal of Economic Behaviour and Organization, 1995, Vol.26, pp.431-443*

Mair A (1994) Honda's global local corporation. Basingstoke: Macmillan Press

Makadok (1999) Interfirm differences in scale economies and the evolution of market shares in *Strategic Management Journal, 1999, 20, pp. 935-952*

Malmberg A (1991) Restructuring the Swedish manufacturing industry: the case of the motor vehicle industry in Law C M (ed.) (1991) Restructuring the global automobile industry: national and regional impacts. London: Routledge

Mariti P and Smiley R H (1983) Co-operative agreements and the organization of industry in *The Journal of Industrial Economics, Vol. 31, Iss.4, June 1983, pp.437-451*

Masten S E, Meehan J W and Snyder E A (1991) The costs of organization in *Journal of Law, Economics and Organization vol. 7.1 1991*

Maxcy G (1981) The multinational motor industry. London: Croom Helm

Maxcy G and Silberston A (1959) The motor industry. London: Allen and Unwin

Maxton G P and Wormald J (1995) Driving over a cliff? Business lessons from the world's car industry. Wokingham: EIU/Addison-Wesley

Mazda (2004) Mazda History. Company website, accessed 6 November 2006, website <http://media.ford.com/mazda/article_display.cfm?article_id=15147>

McAfee R P and McMillan J (1995) Organizational diseconomies of scale in *Journal of Economics and Management Strategy, Fall 1995, Vol.4, No.3, pp.399-426*

Mehrabi M G, Ulsoy A G and Koren Y (2000) Reconfigurable manufacturing systems: key to future manufacturing in *Journal of Intelligent Manufacturing, August 2000 Vol.11(4)*

Merriam S B (1988) Case study research in education: a qualitative approach. London: Jossey-Bass

Miles M B (1979) Qualitative data as an attractive nuisance: the problem of analysis in *Administrative Science Quarterly, December 1979, Vol. 24, Issue 4, pp.590-601*

Miles M B and Huberman A M (1994)(2nd ed.) Qualitative data analysis: an expanded sourcebook (2nd edition). London: Sage

Milgrom P and Roberts J (1992) Economics, organisation and management. Englewood Cliffs, NJ: Prentice Hall

Miller K D and Reuer J J (1998) Firm strategy and economic exposure to foreign exchange rate movements in *Journal of International Business Studies, Vol. 29, pp.493-513*

MIRU (Motor Industry Research Unit) (1988) Rover: profile, progress and prospects. An appraisal and forecast of the Rover Group. Norwich: Motor Industry Research Unit

Monteverde K and Teece D J (1982) Supplier switching costs and vertical integration in the automobile industry in *The Bell Journal of Economics, Spring 1982, Vol. 13, No.1, pp.206-213*

Morris J and Imrie R (1992) Transforming buyer-supplier relations. London: Macmillan

Moschandreas M (1994) Business Economics. London: Routledge

Moyser and Wagstaff (eds.)(1987) Research methods for elite studies. London: Allen and Unwin

Munck R (2002) Globalisation and labour: the new "Great Transformations". London: Zed Books

Nash T (2002) GM's futuristic 'skateboard' in Motor, April, 2002, accessed 15 October 2007 < http://findarticles.com/p/articles/mi_qa3828/is_200204?pnum =4&opg=n9055816>

Nieuwenhuis P and Wells P (1997) The death of motoring?: car making and automobility in the 21st century. Chichester: Wiley

Nieuwenhuis P and Wells P (2003) The automotive industry and the environment. Cambridge: Woodhead Publishing

Nieuwenhuis P and Wells P (2007) The all-steel body as a cornerstone to the foundations of the mass production car industry in *Industrial and Corporate Change (advance access), April 9, 2007, pp.1-29*

Observer (2004) What's Rover driving at? in *The Observer, Business, 4 April 2004, p.3*

O'Callaghan T J O (2002) The aviation legacy of Henry and Edsel Ford. Ann Arbor, MA: Proctor Publications

Odaka K, Ono K and Adachi F (1988) The automobile industry in Japan : a study of ancillary firm development. Tokyo: Kinokuniya

OICA (2006a) The World's Automotive Industry: Some Key Figures. OICA, 29th November 2006, accessed 16th July 2007, website <http://www.oica.net/htdocs/Main.htm>

OICA (2006) Production statistics 1998-2005 from Organisation Internationale des Constructeurs d'Automobiles website, accessed 5 November 2006, website < http://www.oica.net/htdocs/Main.htm>

Panzar J C and Willig R D (1981) Economies of scope in *The American Economic Review, Vol. 71, No. 2, May 1981, pp. 268-272*

Parkin M (1996) Economics. Wokingham: Addison-Wesley

Parkin M, Powell M and Matthews K (1997) Economics (3rd ed.). Harlow: Addison-Wesley

Parliamentary Research Paper (2000) Rover: the story so far from *Economic Indicators, Research Paper 00/41, 3 April 2000*

Pascale R T and Athos A G (1986) The art of Japanese management. Harmondsworth: Penguin

Payne S L (1951) The art of asking questions. Princeton, N J: Princeton University Press

Pilkington A (1999) Strategic alliance and dependency in design and manufacture: the Rover-Honda case in *International Journal of Operations & Production Management 1999, Vol. 19, Iss. 5/6 pp460-473*

Pires S R I (1998) Managerial implications of the modular consortium model in a Brailian automotive plant in *International Journal of Operations and Production Management, Vol.18, Iss.3, pp.221-232*

Plutchik R (1983) Foundations of experimental research. London: Harper & Row

Polanyi K (1963) The great transformation: the political and economic origins of our time. Boston, MA: Beacon Press

Poppo L and Zenger T (1998) Testing alternative theories of the firm: transaction cost, knowledge-based, and measurement explanations for make-or-buy decisions in information services in *Strategic Management Journal, 1998, Vol.19, pp.853-877*

Porter M E (1986) Competition in global industries: a conceptual framework in Porter M E (ed.) Competition in global industries. Boston MA: Harvard Business School Press

Pratten C F (1971) Economies of scale in the manufacturing industry. Cambridge: Cambridge University Press

Professional Engineering (2003) Rover's bumpy road to recovery in *Professional Engineering, 23 July 2003, pp.26-27*

Punch K F (2005)(2nd ed.) Introduction to social research: quantitative and qualitative approaches. London: Sage

PricewaterhouseCoopers (2005) Global automotive financial review, published by PricewaterhouseCoopers, August 2005

Rae J B (1984) The American automobile industry. Boston MA: Twayne Publishers

Rayome D and Baker J C (1995) Foreign direct investment: a review and analysis of the literature in *The International Trade Journal, Vol.9, No.1, Spring 1995, pp.3-37*

Reliable Plant (2007) 2007 Harbour Report: Toyota leads in total productivity in *Reliable Plant, July-August 2007*, accessed 1 August 2007, website <http://www.reliableplant.com/article.asp?articleid=6572>

Rhys G (1972) Motor industry: an economic survey. London: Butterworths
Ricketts M (1987) The economics of business enterprise: new approaches to the firm. Brighton: Wheatsheaf Books

Rogers R P (1993) The minimum optimal steel plant and the survivor technique of cost estimation in *Atlantic Economic Journal, Vol.21, No.3, pp.30-37*

Rosegger G (1987) The economics of production and innovation. Oxford: Pergamon Press

Rossman G B and Rallis S F (1998) Learning in the field: an introduction to qualitative research. London: Sage

Rugman A and Hodgetts R (2001) The end of global strategy in *European Management Journal August 2001 Vol.19, No 4, pp 333-343*

Ryen A (2004) Ethical issues in Seal C, Gobo G, Gubrium J F and Silverman D (eds.)(2004) Qualitative research practice. London: Sage

Schott P K (2003) One size fits all? Heckscher-Ohlin specialization in global production in The *American Economic Review, Vol. 93, No.3, June 2003, pp.686-708*

Sharratt B (2000) The men and motors of "The Austin": the inside story of a century of car making at Longbridge. Yeovil: Haynes Publishing

Shepherd W G (1967) What Does the Survivor Technique Show about Economies of Scale? in *Southern Economic Journal, Vol. 34, No. 1, pp. 113-122*

Shimokawa K (2003) Production innovation at Ford of Europe's Cologne Plant. Nikkan Jidosha Shumbun December 13 2003, accessed 23 August 2006, website < http://imvp.mit.edu/papers/0304/shimokawa_cologne.pdf>

SID (2006) R&D Centres: Tata Motors Ltd. Society for Innovation & Development, Indian Institute of Science Campus, Bangalore. Website accessed 24 August 2006 < http://sid.iisc.ernet.in/tml.html>

Sieradski L (2002) Opel Corsa: the accidental world car, globalEDGE website < http://globaledge.msu.edu/NewsAndViews/views/papers/opel_corsa_accidental_world_car.pdf>, website accessed 27 November 2006

Silberston A (1972) Economies of scale in theory and practice in *Economic Journal, Vol. 82, No. 325, (Mar., 1972), pp. 369-391*

Silver B (2003) Forces of labour: workers' movements since 1870. Cambridge: Cambridge University Press

Slater G and Spencer D A (2000) The uncertain foundations of transaction cost economics in *Journal of Economic Issues, March 2000, Vol.34, No.1, pp.61-87*

Sloan A P (1986) My years with General Motors. London: Penguin

Sloman J (2001) Essentials of Economics. Harlow: Pearson Education

Smitka M J (1991) Competitive ties: subcontracting in the Japanese automotive industry. New York: Columbia University Press

SMMT (2006) Motor Industry Facts – 2005. London: SMMT

SMMT (2006b) Manufacturing plants profile: Toyota Motor Manufacturing (UK) Ltd. SMMT press release, August 2006

Stadco (2006) Stadco signs contract with Nanjing Automobile Corporation (UK). Press release, 16 October 2006, accessed 12 March 2007, website < http://www.stadco.co.uk/news/2006-10-16>

Stake R E (1995) The art of case study research. London: Sage
Stake R E (1998) Case studies in Denzin N K and Lincoln Y S (ed.s) (1998) Strategies of qualitative inquiry. London: Sage

Stake R E (2000) Case study research methods. University of Illinois, unpublished lecture notes, accessed 13 April 2002 <http://www.ed.uiuc.edu/CIRCE/EDPSY399/>

Stigler G J (1958) Economies of scale in *Journal of Law and Economics, Vol. 1, October, 1958, pp. 54-71*

Sturgeon T J (2000) How do we define value chains and production networks?, background paper prepared for Bellagio Value Chains Workshop, September 25 – October 1, 2000, Bellagio, Italy

Sturgeon T and Florida R (2000) Globalization and jobs in the automotive industry. Final report to the Alfred P Sloan Foundation, New York

Sunday Times (2006) BAE to get Nimrod lift-off in *The Sunday Times 16 July 2006 p3*

Teece D J (1980) The diffusion of administrative innovation in *Management Science, Vol. 26, No.5, May 1980, pp.464-470*

Teece D J (1981) Internal organization and economic performance: an empirical analysis of the profitability of principal firms in *The Journal of Industrial Economics, Vol. 30, No.2, December 1981, pp.173-199*

Tellis W (1997) Introduction to case study in *The Qualitative Report, Volume 3, Number 2, July 1997*

Thomas R J (1995) Interviewing important people in big companies in Hertz R and Imber J B (1995)(eds.) Studying elites using qualitative methods. London: Sage

Thoms D and Donnelly T (1985) The motor car industry in Coventry since the 1890's. London: Croom Helm

Thompson A A and Formby J P (1993) Economics of the firm: theory and practice. London: Prentice-Hall International

Times 100 (2004) Nissan: planning for quality and productivity. The Times and MBA Publishing Ltd, file accessed 18 September 2006, website < http://www.thetimes100.co.uk/downloads/nissan/nissan_9_full.pdf>

Times (2007) Chinese deal further blow to Longbridge, accessed 10 February 2007, website <http://business.timesonline.co.uk/tol/business/industry_sectors/ engineering/article1303182.ece>

Tirole J (1989) The theory of industrial organization. Cambridge, MA: MIT Press

Tolliday S (1998) The diffusion and transformation of Fordism: Britain and Japan compared in Boyer R, Charron E, Jurgens U, and Tolliday S (eds.)(1998) Between imitation and innovation: the transfer and hybridization of productive models in the international automobile industry. Oxford: Oxford University Press

Toyota (2007) Global Vision 2010, accessed 25 September 2007, website <http://www.toyotatr.com/eng/gvision2010.asp>

Toyota (2007b) Toyota In The World 2007, accessed 25 September 2007, website <http://www.toyota.co.jp/en/about_toyota/in_the_world/pdf2007/databook_2007.pdf

Truett L J and Truett D B (2001) The Spanish automotive industry: scale economies and input relationships in *Applied Economics, Vol.33, No.12, October 2001, pp.1503-1513*

Truett L J and Truett D B (2003) The Italian automotive industry and economies of scale in *Contemporary Economic Policy, Vol.21, No.3, July 2003, pp.329-337*

UBS/Ricardo (2007) Is diesel set to boom in the US? from company website, accessed 15 October 2007, < http://www.ricardo.com/download/pdf/R119361S.pdf>

UNCTAD (2002) World investment report, 2002. New York and Geneva: United Nations

Underwood J (1989) Will to win: John Egan and Jaguar. London: W H Allen

Vernon R (1966) International investment and international trade in the product cycle in *Quarterly Journal of Economics, Vol.80, No.2, pp.190-207*

Vernon R (1979) The product cycle hypothesis in a new international environment in *Oxford Bulletin of Economics and Statistics, Vol.41, No.4, 255-267*

Viitanen H (2002) Internationalization process and theories. Swedish School of Economics and Business Administration, accessed 18 January 2007, website <www.shh.fi/~polsa/inteory/>

VM Motori (2006) Current vehicles from VM Motori S.p.a. website, accessed 7 September 2006, website < http://www.vmmotori.it/en/01/01/index.jsp>

Volkswagen (2005) Annual report 2005 from Volkswagen AG website, accessed 23 March 2007, website <http://www.volkswagen.co.uk/assets/pdf/AnnualReport2005.pdf>

Walker G and Weber D (1987) Supplier competition, uncertainty, and make-or-buy decisions in *Academy of Management Journal, 1987, Vol.30, No.3, pp.589-595*

World Business Council for Sustainable Development (WBCSD)(2004) Mobility 2030: Meeting the challenges to sustainability, from company website, accessed 15 October 2007, < http://www.wbcsd.org/web/publications/mobility/overview.pdf>

Weijian S (1991) Environmental risks and joint venture sharing arrangements in *Journal of International Business Studies, 1991, Vol. 22, Issue 4*

Wells P and Nieuwenhuis P (2001) The automotive industry – a guide. London: CAIR-BT

Wells P and Rawlinson M (1994) The new European Automobile industry. Basingstoke: Macmillan

Whipp R and Clark P (1986) Innovation and the auto industry: product, process and work organization. London: Frances Pinter

Wilding R and Humphries A S (2006) Understanding collaborative supply chain relationships through the application of the Williamson organisational failure framework in *International Journal of Physical Distribution and Logistics Management, Vol.36, No.4, 2006, pp.309-29*

Wilkins M (1979) The maturing of multinational enterprise: American business abroad from 1914 to 1970. Cambridge, MA: Harvard University Press

Williams B (1997) Positive theories of multinational banking: eclectic theory versus internalisation theory in *Journal of Economic Surveys, March 1997, Vol. 11, Iss. 1 pp71-100*

Williams K, Haslam C, Johal S and Williams J (1994) Cars: Analysis, History, Cases. Providence, RI: Berghahn Books

Williamson O E (1973) Markets and hierarchies: some elementary considerations in *The American Economic Review, Vol. 63, No. 2, May 1973, pp. 316-325*

Williamson O E (1975) Markets and hierarchies : analysis and antitrust implications. A study in the economics of internal organization. London: Collier Macmillan

Williamson O E (1981) The economics of organization: the transaction cost approach in *The American Journal of Sociology 87, 3, November 1981 pp548-577*

Williamson O E (1983) Credible commitments: using hostages to support exchange in *The American Economic Review 73.4 September 1983 pp519-540*

Williamson O E (1987) Antitrust economics: mergers, contracting and strategic behaviour. Oxford: Basil Blackwell

Williamson O E (1991) Comparative economic organization: the analysis of discrete structural alternatives in *Administrative Science Quarterly, 1991, Vol. 36, pp.269-296*

Williamson O E (1993) Opportunism and its critics in *Managerial and Decision Economics, Vol.14 (1993), pp.97-107*

Williamson O E (1996) Economic organization: the case for candor in *Academy of Management Review, 1996, Vol. 21, No. 1. 48-57*

Williamson O E (1998) Transaction cost economics: how it works; where it is headed in *De Economist,1998, Vol.146, No.1, pp.23-58*

Williamson S and Wright R (1994) Barter and monetary exchange under private information in *American Economic Review, 1994, Vol.84, No.1, pp.104-123*

Womack J P, Jones D T, Ross D (1990) The Machine That Changed the World. New York: Rawson Associates/ MacMillan

Wood J (1988) Wheels of misfortune: the rise and fall of the British motor industry. London: Sidgwick and Jackson

World Economic Forum (2002) Mahathir Bin Mohamad, Malaysian Prime Minister. Speech to The World Economic Forum – East Asia Economic Summit 2002 reported in the website for Prime Minister's Office of Malaysia, accessed 15 June 2003, website <http://www.smpke.jpm.my/website/webdb.nsf/?Opendatabase>

Yamaguchi J K (2003) The Mazda RX-8: The World's First 4-door, 4-seat Sports Car. Kanagawa: Ring

Yamin M (1991) A reassessment of Hymer's contribution to the theory of transnational corporations in Pitelis C and Sugden R (eds.)(1991) The nature of the transnational firm. London: Routledge

Yin R (1994) Case study research: design and methods. London: Sage

Yin R (2006) Case study methods in Green J L, Camilli G and Elmore P B (eds.) Handbook of applied social research methods. London: Sage

Youn Kim H (1986) Economies of Scale and Economies of Scope in Multiproduct Financial Institutions: Further Evidence from Credit Unions in *Journal of Money, Credit, and Banking, May 1986, Vol. 18, No. 2, pp.220-226*

Zenger T R (1994) Explaining organization diseconomies of scale in R&D: agency problems and the allocation of engineering talent, ideas, and effort by firm size in *Management Science, Vol.40, No.6, June 1994 pp.708-729*

Appendix 1

Record of data collection

Table A1.1 – MG Rover

Organisation	Participants	Collection Date	Record
MGR PR	Stewart McKee	5/3/03 26/05/04 17/07/06	Field notes Field notes Field notes
MGR PR	Greg Allport	5/3/03	Field notes
Retired Executive/Consultant	John Bacchus	10/6/03 5/08/03	Field notes Email Transcription
Head of Global Training	Alistair Morton	19/06/03	Field notes
Business School Consultant	John Kiff	2/7/03	Transcription
Head, HR Development Director, HR	Rob Ball Bob Beddow	5/8/03	Transcription
Retired Executive	Peter Woods	29/08/03	Transcription
Head of Strategy	Dr Chris Millard (with Stewart McKee) Dr Chris Millard	17/9/03 6/1/04 5/10/05	Transcription Transcription Letter
Director - Product Development	Rob Oldaker	6/1/04 26/05/04 24/11/04 8/8/05	Transcription Field notes Letter Email
International Sales, Head	John Tweedy	21/04/04	Transcription
NAC, Head of Quality	Paul Stowe	8/02/07	Online conference interview
NAC-MG senior manager	Confidential	19/02/07 28/03/07	Transcription Email
Ricardo PLC media relations	Anthony Smith	27/02/07	Field notes

Table A1.2 – Contextual Industry

Organisation Position	Participants	Collection Date	Record
Morgan Assistant Managing Director	Mark Aston	12/7/02 7/03/05	Field notes Letter
Redwood Analyst	Pat Devereux	5/3/03	Field notes
TGWU National Secretary Amicus-AEEU National Secretary	David Osborne Duncan Simpson	13/3/03	Field notes
Rover and MEP	Malcolm Harbour	25/7/03	Transcription
SMMT Policy and Economics	Matthew Croucher	28/08/03	Transcription
Kyoto University Faculty of Economics	Professor Hiromi Shioji	24/10/03	Transcription
Kyoto University Graduate School of Economics	Yasuo Sugiyama Associate professor	24/10/03	Not transcribed
Jaguar Japan President	David Blume	27/10/03	Transcription
Mitsubishi Research Institute Research Director	Ryuichiro Inoue	28/10/03	Transcription
JAMA Deputy Director International Analyst	Shigeru Sasaki Takehisa Yamakawa	29/10/03	Transcription
Honda Tokyo Assistant Manager PR	Tatsuya Iida	29/10/03	Transcription
METI Deputy Director	Sadanori Ito	30/10/03	Transcription
Aston Martin Director PR	Tim Watson	3/12/03	Transcription
Bentley Director, Sales	Adrian Hallmark	20/1/04	Transcription
Bentley Director, Manufacturing	Doug Dickson	20/1/04	Transcription
Bentley Director, Engineering	Ulrich Eichhorn	20/1/04	Transcription
Honda Europe Director, PR	Takeshi Sumita	6/2/04	Transcription
LERC	Prof. Daniel Jones	13/02/04	Transcription
Honda, Japan Deputy Director, Strategy Chief Engineer, Strategy Chief Engineer, Strategy Manager, Strategy	Saburo Kobayashi Hiroshi Kojo Kenji Nakamura Hitoshi Moriguchi	19/2/04	Transcription

Organisation	Participants	Collection Date	Record
ACEA, Japan Director General	Anthony Millington	20/2/04	Transcription
Honda, Japan ex-CEO	Hiroyuki Yoshino	26/2/04	Transcription
Osaka Sangyo University Business Faculty	Prof. Tsutomu Demizu	27/2/04	Transcription
Automotive Engineering International (SAE publication)	Jack K Yamaguchi	27/2/04	Transcription
Honda, Motegi General Manager Chief Engineer, B1	Yutaka Ikeda Kunihasa Watanabe	28/2/04	Transcription
TGWU National Secretary	David Osborne	16/03/04	Transcription
Rolls-Royce General Manager, Sales	Colin Hutchinson	26/03/04	Transcription
Toyota Museum Group Manager	Koji Yamada	8/06/04	Transcription
Toyota Group Manager, PR	Daigo Umeki	8/06/04	Transcription

Appendix 2

Guide to Global Automotive Partnerships: How the World's Automakers are connected (Automotive News September 2004)

Parent Group	Full Ownership	Equity Stakes		Vehicle Assembly Alliances		Technical/Parts Alliances
		Owns	Owned By	JV	Contract Assembly	
BMW	BMW AG: Mini Rolls-Royce		Quandt family – 46.6% Others – 53.4%	BMW Brilliance Auto, China	Magna Steyr, Austria	DaimlerChrysler – small gas engines, Brazil MGR – diesel engines, UK PSA – small gas engines Toyota – diesel engines
Daimler Chrysler	Chrysler Mercedes-Benz (incl. 100% of Maybach, Smart)	McLaren – 40% Mitsubishi – 24.7%	Deutsche Bank – 12% Kuwait Investments – 7% Other shareholders – 81%	Beijing Automotive Industrial Holding	Karmann, Germ. Magna Steyr, Aus. McLaren Group, UK	BMW – small gas engines, Brazil Magna Steyr – powertrains, Austria Ssangyong - engines
Dongfeng Motor Corp	Dongfeng Motor Corp: Dongfeng Liuzhou Motor	Dongfeng Automobile Co – 70%		Dongfeng Honda Automobile (Wuhan) Donfeng Motor Dongfeng Peugeot Citroen Dongfeng Yueda Kia		
Fiat	Fiat SpA	Fiat Auto – 90% (Fiat Auto Owns 100% of Lancia and Alfa Romeo) Ferrari – 56% (incl. 100% of Maserati)	Agnelli family – 30% Public – 70%	Nanjing Fiat-Yuejin Motor PSA-SEVEL, Italy, France Renault-Teksid, Italy Suzuki, Hungary (2005) Tofas, Turkey	Maggiora, Italy Pininfarina, Italy	GM – powertrains/purchasing, Eur and S. America

First Automobile Works Group	First Automobile Works (FAW): Changchun FAW Fengyue Auto	FAW Car – 64%		FAW Hainan FAW Huali (Tianjin) FAW-VW Tianjin FAW Toyota Tianjin FAW Xiali		
Ford	Ford Motor Co: Aston Martin Jaguar Land Rover Volvo	Mazda – 33.4%	Common Stock – 60% Class B (family) – 40%	AutoAlliance, US, Thailand Changan Ford, China Jiangling Motors, China	Ford Otosan, Turkey Otokar, Turkey Pininfarina, Italy Santana, Spain Thai-Swedish Assembly, Thai.	Ford-Otosan Engine, Tur Getrag-transaxles, France Getrag-transmissions, Germany & UK MGR – engines Nemak-aluminium, Can PSA – diesel engines
Fuji Heavy Industries	Fuji Heavy Industries (Subaru)	Suzuki Motor – 1.1%	GM – 20% Suzuki – 2.7% Other shareholders – 77.3%			
GM	General Motors: Adam Opel Holden Saab Automobile Vauxhall Motors	Fiat Auto – 10% Fuji HI – 20% GM Daewoo Auto & Tech – 44.6% Isuzu – 12% Suzuki Motor – 20.3%	Shareholders – 100%	AvtoVaz, Russia CAMI, Canada Delta Motor, S Africa Isuzu-GM, Australia Jinbei GM, China NUMMI, US SAIC GM Wuling Shanghai GM Shanghai GM Dong Yue	AM General, US Bertone, Italy Heuliez, France Industries Mecaniques Maghrebines, Tunisia Magna Steyr, Aus	Fiat – powertrains, purchasing, Eur & S America Honda – gas engines Isuzu – powertrains Pan Asia Technical Automotive Center Shanghai GM Dong Yue Automotive powertrains, China
GM-Daewoo	GM Daewoo Auto and Technology		GM – 44.6% Suzuki – 14.9% SAIC – 10.6% Creditors – 29.9%	GM Suzuki Motor		Holden – engines VM Motori – engine design

Honda Motor Co	Honda Motor Company		Japan Trustee Services Bank – 7.1% Master Trust Bank of Japan – 4.9% Other shareholders – 88%	Bangchan General Assembly, Thailand Dongfeng Honda Guangzhou Honda Honda Atlas, Pak Honda Auto, China		GM – gas engines
Hyundai Motor Co	Hyundai Motor Co	Beijing Hyundai Motor – 50% Dongfeng Yueda Kia Automobile – 50% (Kia) Kia Motors – 47.4%	Hyundai Mobis – 14.5% INI Steel – 5.3% Chung Mong Koo – 5.2% Others – 75%			DC, Mitsubishi Motor – engines VM Motori – engine design
Isuzu Motors	Isuzu Motors		GM – 12% Japan Trustee Services Bank – 7.5% Other shareholders – 80.5%			GM – powertrains Industries Mecaniques Maghrebines, Tunisia
Mazda Motor	Mazda Motor Corp		Ford Motor – 33.4% Japan Trustee Services Bank – 9.6% Others 57%	AutoAlliance, US & Thailand Suzuki Motor	Colombiana Automotriz, Colombia	
MG Rover (2000-2005)	MG Rover Group: Qvale		Phoenix Venture Holdings – 100% (MGR dealers and employees – 60%; J Towers, N Stephenson, J Edwards, P Beale – 40%)	Tata, India		BMW – diesel engines Ford – engines Lotus – engines SAIC - development

Mitsubishi Motors	Mitsubishi Motors: Netherlands Car (NedCar)		Phoenix Capital Assoc – 33.3% DaimlerChrysler – 24.7% Mitsubishi HI – 9.9% Mitsubishi Corp – 3.5% Other shareholders – 28.6%	Beijing Automotive Industrial Holding DC, China Hunan Changfeng, China Proton	Pininfarina, Italy	Asian Transmission, Philippines
Nissan Motor	Nissan Motr	Dongfeng Motor – 50% Renault SA – 15% Zhengzhou Nissan Automobile – 30%	Renault SA – 44.4% Japan Trustee Services Bank – 5.5% Nissan (self owned) – 2.7% Other shareholders – 47.4%			
Porsche	Porsche AG		Porsche and Piech families – 50% Institutions – 30% Public – 20%	VW, Slovakia	Valmet, Finland	VW - engines
PSA Peugeot-Citroen	PSA/Peugeot-Citroen	Dongfeng Peugeot Citroen Automobile – 32%	Peugeot family – 29.2% Others – 70.8%	Fiat/SEVEL, Italy & France Toyota Peugeot Citroen, Czech	SOMACA, Morocco	BMW – small gas engines Ford – small diesel engines Renault – engines and transimissions
Renault	Renault SA: Dacia (99.3%)	Avtoframos – 62% Nissan Motor – 44.4% Samsung – 70.1%	Public – 61.2% Nissan Motor – 15% Other shareholders – 23.8%	Fiat/Teksid, Italy GM, Europe Nissan, Spain Dongfeng, China	Bursa, Turkey IDRO, Iran SOFASA, Colombia SOMACA, Morocco	Bursa – powertrains, Tur Cofal – LCV engines, Bra Isuzu – diesel engines PSA – engines and transmissions

Shanghai Automotive Industry Corp	Shanghai Automotive Industry Corp (SAIC)	GM-Daewoo Auto & Technology – 10.6%		Jinbei GM SAIC GM Wuling Shanghai GM Shanghai GM Dongyue Shanghai VW		MG Rover – development, UK (Ricardo 2010 from 2005)
Suzuki Motor	Suzuki Motor Corp	Fuji Heavy – 2.7% GM-Daewoo Auto & Technology 14.9% Maruti Udyog – 54.2%	GM – 20.3% Fuji Heavy – 1.1% Chase Manhattan Bank – 8.1% Other shareholders – 70.5%	CAMI, Canada Chongqing Changan Suzuki, China Fiat, Hungary (2005) Jiangxi Changhe Suzuki, China Mazda, Japan Mitsubishi, Japan Nissan, Japan Santana, Spain		
Toyota	Toyota Motor Corp	Daihatsu Motors – 51.2% FHI – 8.7% (Oct 2005) Isuzu – 5.9% (Nov 2006)	Master TB of Japan – 7.8% Toyota (self owned) – 7.7% Japan TSB – 7.5% Toyota Industries – 5.4% Others – 71.6%	Indus Motor, Pakistan Kuozui Motors, Taiwan NUMMI, US Sichuan Toyota, China Tianjin FAW Toyota Toyota Peugeot Citroen, Czech		BMW – diesel engines FAW Toyota Changchun Engine, China Guangqi Toyota Engine Tianjin Fenjin Auto Parts – components, China Tianjin Toyota Motor Engine, China
VW	VW AG: Audi AG (99.1%) (Audi owns 100% Lamborghini) Bentley Motors Bugatti Seat Skoda		Institutional abroad – 34.1% Private shareholders – 33.1% State of Lower Saxony – 13.7% VW (self owned) – 9.8% Institutional Germany – 9.3%	FAW-VW, China Ford, Portugal Porsche, Slovakia Shanghai VW, China		

Appendix 3

15 November 2002

Dear Mr McKee,

I was recommended to contact you by Teresa Kelly in the Education Partnership department. I am a PhD student at the Cardiff Business School where I am looking at globalisation in the automotive industry. I have chosen MG Rover as my case study, partly because of my personal enthusiasm for the company and partly because the company has to have the most exciting potential of any firm in the industry today. However, my own energy alone is not enough to carry the research through and I need to ask for MG Rover to indulge me by granting permission to conduct interviews.

I have spoken to Teresa about this and provided her with a list of the kind of questions I would like to ask; I would be delighted to have the opportunity to send a copy to you. I am looking at how MG Rover can use the process of globalisation for its own ends and remain successfully independent, instead of being swallowed by an anonymous multinational. I do not believe that my research would be a risk to the company's need for commercial secrecy but I would of course respect all information as confidential. I recently spoke with Gavin Thompson, who was tremendously helpful, and he is exactly the kind of person with whom I would like to meet.

Ultimately, I very much hope that my research will prove useful to the company even if over the course of the next two years of research the potential benefit may not be obvious. If you require me to clarify any points please do not hesitate to contact me,

Yours faithfully,

Michael Wynn-Williams

Tel: 029 2087 4001

Appendix 4

Tel: +44 (0) 29 2087 4001

1st September 2003

Dear Sir,

I am a PhD researcher in the Japanese Studies Centre at Cardiff Business School looking at globalisation in the car industry. I have taken as my case studies MG Rover and Honda, looking at how they have progressed since their collaboration in the 1980s. It is well known that Honda have gone on to becoming a major global force in the industry with operations all over the world and I am seeking to gain an overview of the factors that have led to their international success. I believe that their strategy may come to represent a new business model.

It is my consideration that a great deal of the company's success is due to the specifics of its Japanese origin. I am not simply referring to national cultural mores but the particular circumstances from which Honda emerged. This includes supply and demand characteristics, national and company skill bases as well as governmental factors. It is my belief that while much of Honda's success is translatable to its foreign operations it is still important for the company to retain its core capabilities at its place of origin.

For this purpose I need to have a clear understanding of the context within which the company operates, from the progressive internationalisation of the Japanese automotive industry to the attitudes of the government towards globalisation. It is my hope that you will grant me the opportunity to conduct interviews so that I may benefit from the experience of experts in the field. This will provide invaluable credibility for my research and so will ultimately contribute to the future prosperity of both Japan and the United Kingdom. Since I have lived in Japan for several years and come to love the country as a second home it is my sincere wish that I be able to make a contribution to both nations.

I hope the accompanying information gives you some idea of the purpose of my research. Naturally I would welcome the opportunity to discuss the finer details of my information needs with you at your convenience. Please feel free to contact me, either by mail, email or telephone.

I look forward to hearing from you,

Yours sincerely,

Michael S Wynn-Williams

Appendix 5

Mr P Woods
August 8th 2003

Dear Mr Woods,

Thank you for the telephone conversation today. As I mentioned you were recommended to me by Malcolm Harbour who had kindly allowed me to interview him. I have also had extensive contact with John Bacchus and various people at MG Rover and Honda.

I am a PhD researcher at Cardiff Business School looking at globalisation in the car industry, working in the same department as Professor Garel Rhys. My research concerns MG Rover and Honda, specifically how they have faired within the global industry since their original collaboration. The actual details of the alliance are not the focus of my study, but the relationship gives me the opportunity to compare two independent companies that at one time shared a common view of the global industry. I am interested in how the two companies are working within the same global trends to maintain independence and I believe that the evolving strategies may come to represent a new business model.

John Bacchus has been, and continues to be, very helpful in illuminating the period up to the alliance. Members of the companies have been talking to me about the current global opportunities. However, I am also keen to discover the Japanese angle. For example I find that Honda, despite having functionary departments spread around the world, retain all their core capabilities within Japan. It would appear to me that they are still very much Japan based and I would like to know how this influences their international competitive position. Furthermore I believe that both the industry and the consumer benefit from independent minded companies that retain their domestic orientation. I would like to find that there is a room in the world for a Japanese Honda and a British MG Rover, indeed that there is a necessity for them to remain. However, to do that I need to get to the roots of these individual companies and the international context within which they operate.

Clearly you are the expert on the Japanese part of the equation and I am sure you will be able to provide critical insights. I would be grateful of the opportunity to interview you, for which I would be happy to provide a list of topics and questions in advance by way of preparation. In the meantime, if there is any thing you wish me to clarify please do not hesitate to contact me.

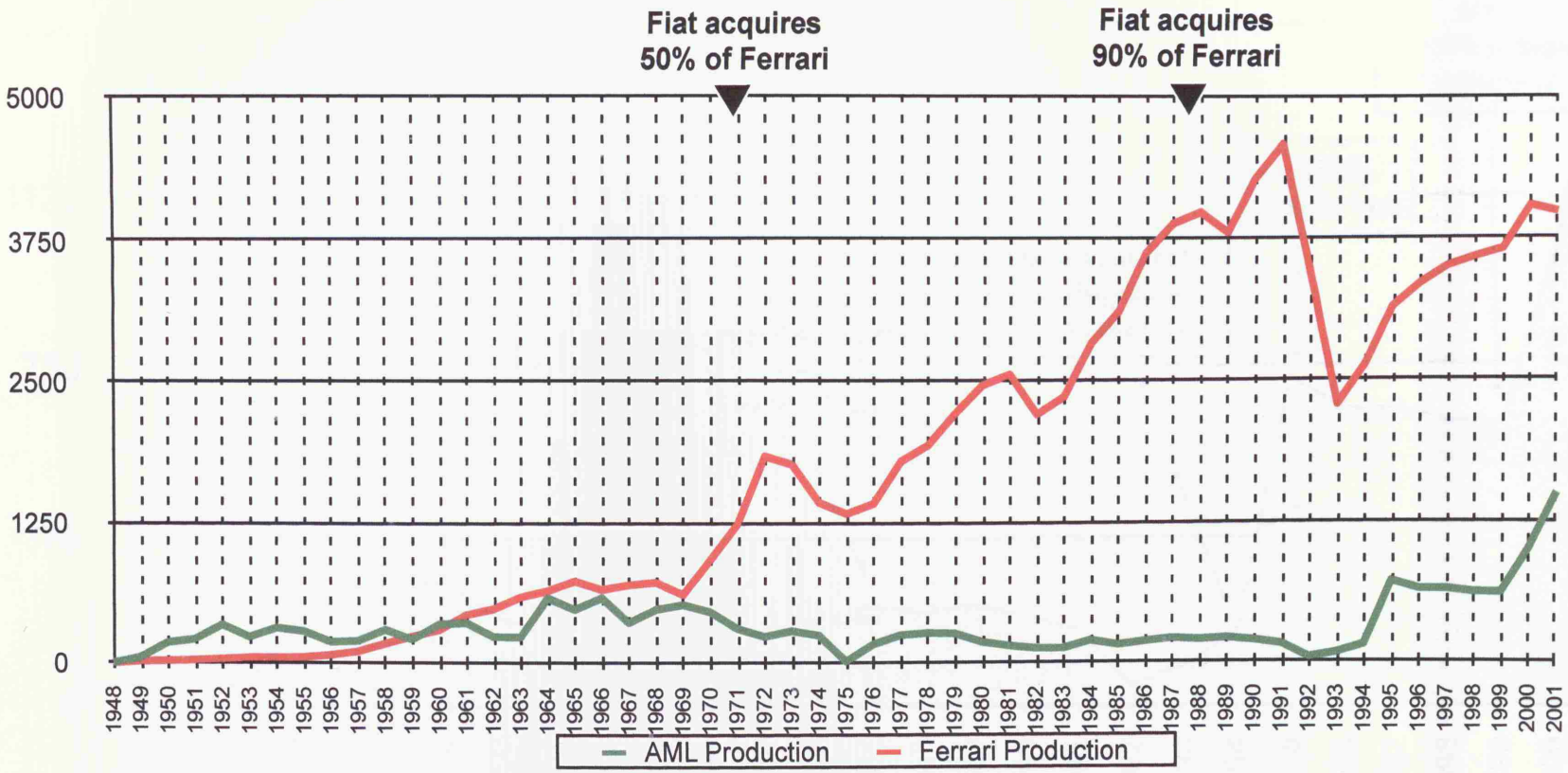
I look forward to hearing from you,

Yours faithfully,

Michael S Wynn-Williams

Appendix 6
Power of a parent (1)

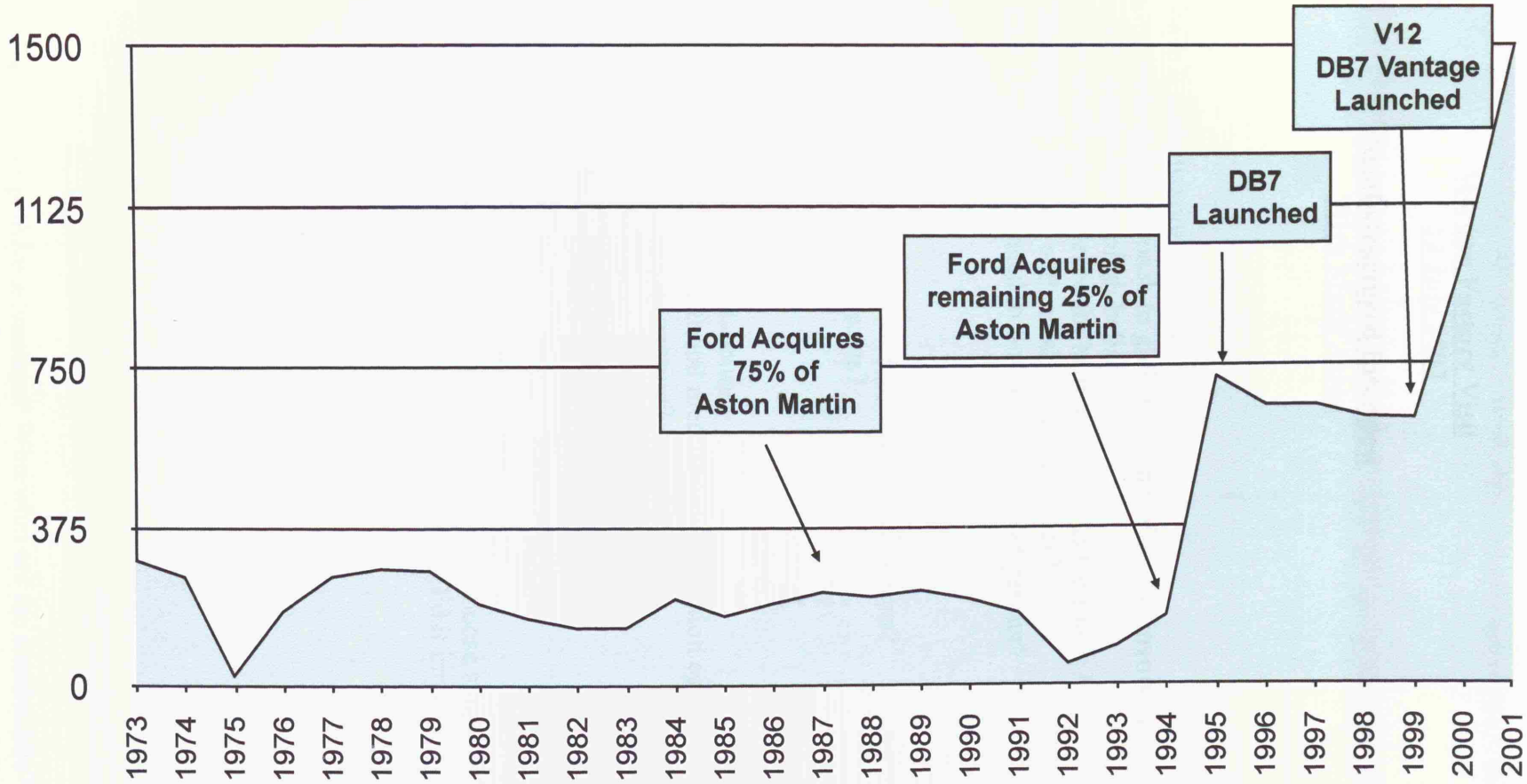
The Power of a Parent



Appendix 6

Power of a parent (2)

Aston Martin – Production '73-'01



Appendix 7

Morgan Factory Visit
12 July 2002

Semi-structured Interview
With Mark Aston

Global Strategy

1. Does Morgan have a globalisation strategy?
2. How did Morgan develop its approach to globalisation? Who was involved?
3. How does Morgan see the future of globalisation?
4. What are the benefits of independence for Morgan? What is the future?
5. Has Morgan considered a merger with another manufacturer?
6. In what areas does Morgan most need to find a collaborative partner?

Politics

1. Does Morgan benefit from globalisation of standards/certifications?
2. Does Morgan receive government/EU grants?

Production Process

1. How much does Morgan manufacture in-house?
2. Has Morgan been influenced by international methods of production eg JIT?
3. Is Morgan capable of simultaneous engineering?
4. How flexible is the production line?
5. Would Morgan consider manufacturing overseas?

Supply

1. To what extent does Morgan work with suppliers? Is it free to choose suppliers?
2. Were BMW actively involved with the design of the Aero 8? Did it impose restrictions? What did BMW gain?
3. What proportion of supply is of foreign origin?

Market Demand

1. Can Morgan support global sales?
2. Can Morgan use BMW sales/service outlets?
3. What proportion of production is exported?
4. What provision is made for exchange rate fluctuations?

X Factor

1. What is Morgan`s main competitive advantage? Who/what are the competition?
2. What core skills does Morgan have/lack?

Appendix 8

BMIHT June 2003

Interview Protocol

Interviewee: Mr John Bacchus Date: 10th June 2003

Company: BMIHT/Rover Place: Gaydon

Position held: Head of relations with Honda

Contact details:

1975

Key Issues:
Ryder Report
CPRS
NEB

Points for consideration:

1. Had British Leyland failed to consolidate an international presence?
2. Had there been the possibility of an international joint venture?
3. Had the threat of foreign competition been fully appreciated by the reports?
4. What lessons could have been learnt from international competitors at this stage?
5. Did the Ryder Report take into consideration the importance of the global industry?
6. Why was Ford consistently profitable? Did its international presence give it a particular advantage?
7. What would consumers have lost had BL disappeared?
8. Did the failure of BL show that mergers necessarily involve a total loss of independence?
9. Was the survival of BL important for the British economy as a whole? Was it important for the global industry?
10. Should the government aid have been restricted purely to a financial safety net? Was the rescue of Rolls Royce a better model to follow?

1980

Key Issue:
Collaboration with Honda

Points for consideration:

1. Were BL and Honda looking to gain from collaboration in the same way, or were their intentions complementary?
2. Was there something uniquely Japanese about Honda that made them an ideal partner? Did Honda need something uniquely British from BL?

3. Was independence still a preferred state for BL?
4. Was decentralisation an admission by BL that a degree of autonomy within the company was good for business? Can we say the same for joint ventures?
5. Were the products (e.g. new Metro) of international standing?
6. Was there a strategy for maintaining an international presence?

1985

Key Issue:

Memorandum of Understanding with Honda (one of many?)

1. Did the closer relationship represent a continuing loss of competency by Rover?
2. What did Rover gain? What did Honda gain?
3. Was Rover becoming too Japanese? Better Japanese than French or German?
4. Could the relationship have been extended to international locations e.g. joint manufacturing in the US?
5. Would increased government support have been more beneficial to Rover, rather than closer collaboration with a partner?
6. Was Rover competitive in international markets? Was this thanks to Honda?

1990

Key Issue:

Ownership by BAe (from 1988)

1. Did Rover gain from being part of a company with international standing? Did it increase its global presence?
2. Did Rover benefit from having a British parent, as opposed to being sold to a foreign company?
3. Did Rover find synergies with its parent? How was Rover reshaped?
4. Did Rover intend to collaborate ever closer with Honda?
5. Did Rover intend to maintain independence?
6. Was the government still involved?
7. How was Honda being reshaped by the changing relationship? Did it learn lessons it could use globally?

1995

Key Issue:

Ownership by BMW

1. What did Rover gain from being part of an international company?
2. Was Rover given too much independence?
3. Was Rover constrained by being owned by a foreign rival?
4. Was there something uniquely British about Rover that attracted BMW? Did they obtain it?
5. What did BMW contribute that no other company could have done? Was it because they were German?
6. Would continued collaboration with Honda have brought greater benefits instead?
7. How did BMW ownership reshape the company?
8. Was Rover becoming more international again?

2000

Key Issue:

Independence

1. What did MG Rover save by being sold? Was it too late?
2. What did BMW learn that was uniquely British? Did this change BMW?
3. Was the involvement by government to the advantage of MG Rover?
4. What would have been the future of MG Rover had BMW not sold it?
5. How has independence reshaped the company? Does it retain a full range of competencies?
6. What should the global industry learn from the experiences of BL/Rover/MG Rover?

2005

Key Issues:

Long term viability
International partners
International sales

1. Is it to MG Rover's advantage to remain independent? What does independence mean within the global industry?
2. What does it mean for a company to be "globalised"?
3. Do foreign manufacturers have unique advantages?
4. Does the global industry need MG Rover?
5. What will the future competitive pressures be?
6. What are the most pressing challenges/costs within the industry?
7. Is it possible for a company of MG Rover's size to survive? What level of production output and model range is necessary?
8. What are the core competencies necessary for MG Rover's long term success?
9. What kind of collaboration would bring long term survival?
10. Should the UK government be more supportive?
11. Is it to the customer's advantage for MG Rover to remain independent/British?
12. Should MG Rover remain fundamentally British? Does the UK industry have a uniquely British contribution to make to the global industry?

Appendix 9

Mr Rob Oldaker

Interview Protocol

Interviewee: Mr Rob Oldaker
Company: MG Rover
Position held:
Contact details: 0121 482 3397

Date: 06/01/04
Place: Longbridge

Globalisation

1. Is MG Rover at a good economic size with regards to:
   i) R&D
   ii) Production levels (eg break even levels)
   iii) Marketing and distribution (eg resources to open new markets)
2. How can MG Rover "punch above its weight"?
3. Is globalisation the death of innovation? Does it destroy differentiation of products?
4. Will consumers begin to react against globalisation?
5. What would MG Rover benefit from a globalised industry? Is the MG ZT 260 a good example of this?
6. What should MG Rover avoid in a globalised industry?
7. Within a spectrum of high value to low value, which products benefit least from globalisation?
8. Does the purchasing of technologies on the global market mean that MG Rover no longer has the ability to be a market leader/maker?
9. To what extent can MG Rover move its products around the world to accommodate changes in other markets (e.g. selling an ageing model into China to extend the model life)?
10. Can MG Rover sustain the benefits it gained from the relationship with Honda and BMW?
11. If you were to create the perfect car company by cherry picking aspects of existing firms, what would you choose and from whom?
12. What proportion of components are imported?
13. Does MG Rover have the resources to enter a new market by itself?

UK Industry

1. Does the UK industry need MG Rover to maintain its core capabilities?
2. Should the UK Government give preferential treatment to MG Rover?

Indian Industry

1. Is the Indian market the next global opportunity, after China?
2. What can they learn from UK manufacturers?
3. What lessons can MG Rover learn from TATA that can be applied at home (cf. Honda's influence on production technology)?

4. To what extent is the CityRover a pilot study for a deeper relationship?
5. Does MG Rover have reciprocal access to the Indian market?

Joint Ventures

1. What are the advantages of independence that are unique to MG Rover?
2. Does flexibility mean that MG Rover is a short-term planner?
3. The president of Jaguar Japan described the rescue by Ford thus: Jaguar was a raft being tossed about in a storm, the good ship Ford rescued it and took it on board. In the future Jaguar will be refloated and will become part of the Ford flotilla (i.e. independent but part of a larger group). Would you like this to happen to MG Rover?
4. Do you have a team specifically looking for joint ventures? Do you use formal processes?
5. Do joint ventures spread the management talent too thinly?
6. Can the TATA collaboration only be for low value products? Should MG Rover develop other collaborations concurrently?
7. Regarding the following two kinds of joint venture:
   i) A few comprehensive joint ventures or a network of specific projects
   ii) Long term or short term relationships

Do these represent the choices facing MG Rover?

8. Chris Millard mentioned two types of relationship:
   i) Roverising a product already being made elsewhere, adding to their existing scale (eg. CityRover)
   ii) Equal partners, where you both have to strive to achieve scale.

Which is most suitable for MG Rover?

9. What kinds of problems were evident from working with a partner? Were the problems generic or specific to this partner?
10. Does MG Rover have purchasing power with regards to suppliers?
11. What proportion of new car projects are contracted out (cf. SV and RD60)?
12. Does MG Rover need to make itself attractive to potential partners/parents?
13.

The Brand

1. How important is authenticity (i.e. British made and designed)?
2. Who buys MG Rovers?
3. How do you manage the brand image in different markets (eg relative success in Mexico and Germany)?
4. How close do you need to be to your customers (especially foreign markets)? How do you communicate with your customers?
5. Are product features paramount, or can you extend the brand image over mediocre products?
6. Should MG Rover develop more variants (eg 75 Coupe, 4WD etc)
7. How does the SV fit with MG Rover?

NB: Request Japanese contacts

Appendix 10

Fieldwork Japan 2003

Interview Protocol

Interviewee:
Company:
Position held:
Contact details:

Date:
Place:

Globalisation

1. Is globalisation an inevitable process?
2. How far will globalisation extend?
3. Does company size matter?
4. Will globalisation cause the death of innovation?
5. Do the industry and the consumer need independent manufacturers?
6. Should manufacturers be locally based?
7. What does Honda benefit from a globalised industry?
8. What should Honda avoid in a globalised industry?
9. Within a spectrum of high value to low value, which products benefit least from globalisation?
10. Is it a paradox that high value products need to be close to their customers but in foreign markets this would dilute the core brand values (i.e. would a Honda assembled in China not be considered an authentic Honda by the customers and so weaken the Honda reputation)?

UK Industry

1. What does Honda expect to gain from a UK operating base?
2. What are the strengths and weaknesses of the UK industry now?
3. How can UK car manufacturers continue to benefit from Honda's influence?

Japanese Industry

1. Does the Japanese industry represent a threat to the UK industry?
2. Does Honda consider Japan to be the home base?
3. What can Honda learn from UK manufacturers?
4. Will the Japanese market be as open to imports as the UK market?
5. Could UK manufacturers ever start manufacturing bases in Japan?
6. How will the Japanese industry change in the future?

Joint Ventures

1. Taking the following companies as examples of the opportunities and dangers of globalisation, what would the implications be for Honda in evaluating the need to stay independent
   i) Saab under GM
   ii) Alfa Romeo under FIAT
   iii) VW`s sophisticated badge engineering

2. What core capabilities should Honda defend in any collaborative deals?
3. How did the experience with Rover change Honda's attitude to joint ventures?

Government

1. Should the Japanese Government maintain an active interest in Honda?
2. Should the EU take an active interest in Honda?
3. Is Honda a local European company in Europe?

Appendix 11

Dr C Millard
Head of Product Development and Strategy
MG Rover Group
PO Box 41
Longbridge
Birmingham B31 2TB

August 7th 2003

Dear Dr Millard,

I am a PhD researcher at Cardiff Business School looking at globalisation in the car industry, working in the same department as Professor Garel Rhys. Like him I have a great interest in the fortunes of MG Rover and so it was a natural choice for me to take the company as my case study. My research is focused on the period since the collaboration with Honda in the 1980s. MG Rover provides unique insights into globalisation over this period since it is the only manufacturer of any note that has shown new and original approaches to the perennial problems of the industry. I am interested in how MG Rover are using the same global trends to maintain independence and I believe that the evolving unique strategy may come to represent a new business model. It goes without saying that product development lies at the very centre of the company's future.

Bob Beddow and Rob Hall of the Human Resources department were kind enough to give me a great deal of guidance on how the company has been shaped by events since the 1980s. I have also had extensive contact with Stewart McKee. However, as my research concerns the very core of the company's purpose, it is crucial that I be able to obtain first hand information from you. Your input would provide the credibility that my project requires to achieve recognition. Naturally I am happy to fit in with your busy schedule, and I would provide you with details of discussion topics in advance.

As I have made clear to those I have interviewed previously I am quite willing to respect commercial sensitivities by formally agreeing to any requirements for confidentiality and anonymity. However, I am more concerned with the generalities of MG Rover's approach to global opportunities and threats rather than specific product plans. My main priority is to complete this research so that it would also benefit the company in which I share such an abiding interest. I realise that before making a commitment to helping me with this project you may wish me to clarify any points so please do not hesitate to contact me. My office telephone number is:

029 2087 4001

I look forward to hearing from you,

Yours faithfully,

Michael S Wynn-Williams

Appendix 12

Codes

Topical Codes	Modifier Codes	Intensifier Codes
Globalisation Globalisation: GL Foreign Direct Investment: FDI Local/Domestic: LC	Trade Trade: TR Export: EX Import: IM Protection: PR Regulation: RG Representation: RP Direction/Guidance: DR	Positive: + Negative: - Query: ?
National Industry National industry: NI	Strategy Strategy: ST Future: F Learning: L Joint venture: JV Vertical joint venture: VJV Horizontal joint venture: HJV Potential partner: PP Action outside joint venture: IJV Merger: MG	
Government Government: GV	Industry Industry: I Supply: SU Transplant: TR Kit Assembly: CKD Research: RS Human Resources: HR Management: MT Intellectual property right: IPR	
	Technical Technology: TC Design: D Manufacturing: M Flexible production: FL	
Company Structure Vertical Integration: VI Horizontal Integration: HI Independent: I Multinational company: MNE	Economic Economies of scale: ES Financial: FC Environmental issues: E	
	Market Brand: B Market: MK Competition: CT	
	Regional Africa: AF India: IN Australasia: AU Iran: IR China: C Russia: R Europe: EU United Kingdom: UK Japan: J United States: US	
	Culture Culture: C Company specific: CS	

Appendix 13

Global Manufacturers: Rank by 2006 Output

Rank	Company	Output
1	Toyota	9,018,000
2	GM	8,743,248
3	Ford	6,563,092
4	Volkswagen	5,659,578
5	DaimlerChrysler	4,589,100
6	Hyundai-Kia	3,778,166
7	Honda	3,633,813
8	Peugeot-Citroen	3,357,000
9	Nissan	3,238,346
10	Fiat	2,363,968
11	Renault	2,346,319
12	Suzuki	2,342,192
13	BMW	1,366,838
14	Mitsubishi	1,313,076
15	Mazda	1,285,320
16	AvtoVaz	803,266
17	China FAW	690,227
18	Isuzu	622,317
19	Subaru	592,656
20	Chongqing Changan	463,503
21	Dongfeng	462,733
22	Tata	454,345
23	SAIC	437,752
24	Chery	308,425
25	Gaz	237,016
26	Hafei	231,917
27	Volvo	221,726
28	Zhejiang Geely	207,149
29	Navistar	173,150
30	Anhui	171,483
31	Paccar	166,800
32	Mahindra & Mahindra	148,213
33	Proton	144,935
34	Iran Khodro	131,674

Source: Automotive News, 2007a

Appendix 14

Global Manufacturers 1975-2005

Production output (000s)

Company	1975	1980	1985	1990	1995	2000	2005
GM	4954	5605	6992	4998	5777	5247	5657
Toyota	1715	2303	2678	3445	3371	4656	6157
Ford	3177	2903	3924	3371	3753	4039	3514
VAG	1547	2228	2474	2165	3007	4859	4979
Honda	328	846	1121	1658	1576	2251	3324
PSA		1656	1439	1978	1694	2494	2983
Nissan	1533	1940	2028	2117	2158		
Chrysler	1839	711	1484	1220	1050		
Renault	1486	1817	1478	1317	1518	4144	4892
Hyundai			226	558	1007	2023	2727
Fiat	1078	1185	1486	1875	1831	2184	1540
Suzuki	51	88	272	512	789	1182	1723
DC						2043	1965
Mazda	387	737	867	1302	722	822	1092
Kia				222	458		
BMW	217	330	444	500	595	835	1323
Mitsubishi	289	660	636	833	1085	1094	998
Daihatsu	92	156	163	373	328		803
AvtoVAZ		713	798	900	525	756	721
Fuji	109	202	262	319	377	500	508
Tata							163
FAW							59
Chery							186
Gaz						117	52
SAIC							132
Porsche							98
Great Wall							68
Proton					157	181	188
Nanjing							111
Uaz							29
Kamaz							30
Daewoo			37	185	501	758	
Isuzu	65	107	213	202	52	36	
MG Rover	605	396	466	465	475		29
Mercedes	350	439	552	574	600		
Volvo	225	136	395	156	371		
Saab			112	93	97		
Alfa Romeo	190	220	162				

Company	1975	1980	1985	1990	1995	2000	2005
Jaguar			38				
SEAT	332	294	201	324			
Skoda			174				
AMC	324	165					
Citroen	624						
Peugeot	578						
Ijmach-Avto							43
Others			754	1188		785	
Total	24070	27817	33861	34840	35869	43006	48099

Source: OICA, Ward's Automotive
Proton data courtesy of Global Insight