

'The Dream Factory': VW's Modular Production System in Resende, Brazil

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ABSTRACT This paper draws upon on-going research into the changes taking place in the Brazilian vehicle assembly industry with particular reference to the state of Rio de Janeiro. It focuses upon a case study of Volkswagen's bus and truck assembly plant at Resende. The plant opened in 1996 on a green-field site and was presented as a major development in vehicle assembly. The unique feature of the plant's production system rests on the relationship between the assembler (VW) and its component suppliers. At Resende these were involved in a joint enterprise to establish a 'modular system' of production. In this system, the component suppliers finance a part of the factory and organise the assembly of their components on site. As such few of the production workers are employed by the assembler whose main role in the process is to co-ordinate production and market the vehicle. The article outlines the nature of the Resende system and the negotiations and comment that accompanied its introduction. It considers the development in relation to literatures on the boundary and capacity of the firm and those relating to the role of labour in mature labour processes. In drawing upon wider changes in the Brazilian vehicle manufacturing sector it argues that the Resende experiment can be understood as an extreme case of a more general development in Brazil, involving changed relationships between assemblers and component suppliers and also with the manual workers. Some consideration is given to the idea of an emerging 'Brazilian system' of production and its implication for more general developments within the sector.

Studies of the automobile industry and changes in the organisation of its production systems have focused, almost exclusively, upon plants operating in the OECD states. The major research project, conducted by the MIT – *The Machine that Changed the World* – made no reference to the industry beyond Europe, the USA and Japan. Throughout the literature there is an implicit assumption that all of the main developing tendencies in the industry can be observed in the plants operating in the advanced capitalist states. Here the pattern is seen to be one of lean production, linked with team working and rapid automation through the use of computers and robotics. In locations beyond the OECD states, the industry has been largely under-

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stood as derivative to the main dynamic that drives the system from Detroit, Tokyo and Wurtsburg. As such it is interesting to note the view of Sean McAlinden a specialist in transport studies at the University of Michigan. In a major report on the car industry in *The New York Times* he was quoted as saying that: 'the most important prototypes of plants today, are prototypes of plants for the third world' (19 November 1996).

This paper focuses upon one such plant – the truck plant of VW in the state of Rio de Janeiro in Brazil – and as such is one of few which have studied vehicle manufacture outside of the OECD states (see e.g. Shaiken 1994 and Parlack 1996). It argues that this case can be seen as emblematic of a new kind of production system emerging in the South of America. Moreover, the case can be seen to inform the on-going debate about the role of subcontracting within contemporary capitalism and issues relating to the boundaries of the firm and the relationship between markets and hierarchies.

Restructuring and Inward Investment in Brazil

Major changes took place in the vehicle manufacturing sector of Brazil in the late 1990s. They seem set to continue into this decade and have a strong impact upon the world industry. All of the major assembly companies have made significant investment in new plants and production facilities (see Table 1). These plants are geared to the expanding domestic market facilitated by Mercosul, and increasingly to exporting cars and trucks to the USA and the expanding new markets of Eastern Europe, South Africa and China. In a way that has become familiar in Europe, the assemblers have taken great care in choosing the locations for these new plants. Since 1995 all of them have been sited away from the industrial region surrounding São Paulo (the 'ABC'). This area has been for decades the most highly unionised area of Brazil and the militant centre of the metal workers' union and the socialist confederation CUT. The pattern of investment in these new plants has been away from large urban centres in the South and South-East of Brazil. This pattern was broken recently by Ford. The company took advantage of competition between the federal states to shift a projected new development from the South to the industrialising state of Bahia in the North East (*The Financial Times*, 8 August 1999).

This spatial shift has been associated with significant changes in the production system and specifically in the relationship between the assembly firms and the component suppliers. This has involved a radical restructuring of the Brazilian component industry (see Beynon and Ramalho, 1999; and Abreu, Gitahy, Ramalho and Ruas, 1999). In the case of the auto-assemblers, Gitahy and Bresciani (1997) have stressed the increasingly marked shift towards the outsourcing of mainstream activities. Salerno (1997: 509–10) has documented the trend towards 'industrial condominiums' that cluster suppliers around the main assembly plant, reducing

Table 1

The new assembly plants and their locations

<i>Company</i>	<i>Location</i>	<i>Opening date</i>	<i>Model</i>	<i>Capacity (ooo's)</i>
Honda	Sumaré (SP)	1997	Civic	30
Chrysler	Campo Lago (SP)	1998	Dakota	40
Toyota	Indaiatuba (SP)	1998	Corolla	15
Renault	S.J. dos Pinhais (PR)	1998	Scenic	120
Mercedes-Benz	Juiz de Fora (MG)	1999	Classe A	70
VW	S.J. dos Pinhais (PR)	1999	Golf	160
GM	Gravataí (RS)	2000	Blue Macaw	120
Peugeot	Porto Real (RJ)	2000	206	100
Ford	Camaçari (BA)	2001	Amazon	250

Source: Gazeta Mercantil, 11 August 1999

Note

SP São Paulo

PR Paraíba

MG Minas Gerais

RS Rio Grande de Sud

RJ Rio de Janeiro

BA Bahia

transportation costs, streamlining integration and ensuring a steady flow of just-in-time supplies. Humphrey (1998) has developed this account and in a detailed analysis of one plant has argued that the commodity production chain emerging in Brazil is complex and not easily deduced from an abstract notion of 'globalisation'.

These studies all indicate that the relationship between the assembler and the component suppliers has been the basis for experiments in new production processes. The new bus and truck plant, opened in 1996 on a green-field site by Volkswagen in Resende, was an advanced expression of this experimentation. At Resende the component suppliers were involved in a joint enterprise with VW to establish a 'modular system' of production. Previously attempted by VW in one of its car assembly plants in Argentina (see Miozzo, 1999) this system involved the component suppliers as partners in the financing of the factory and in the organisation and assembly of their components on site. As such, few of the production workers were employed by VW whose main role in the process was to co-ordinate production and market the vehicle.

This 'modular factory' represented an interesting new concept in vehicle manufacture. As such, and as part of our on-going research into the new automotive industry in Rio de Janeiro state, we decided to pay particular attention to the Resende case. In this we visited the factory and, during the early stages, discussed the development with local business people, politicians and trade unionists. We have followed

'events' in the factory and paid particular attention to the ways it has been represented in the local and national press. Our research (involving interviews with workers and supervisors) is on-going and this is our first attempt at an assessment of some of the data.

The Resende System

At Resende a total of \$300 million was invested with a planned production of 30,000 bus-chassis and trucks a year. The biggest part of this production was to be for export – to Mercosul, the USA and Europe. The plant was opened with considerable publicity with both the company and the Brazilian government emphasising its enormous significance for the Brazilian economy and the future of the automobile industry worldwide. In a language which was to become common in the industry, VW argued that its new system of 'modular assembly' was governed by a 'fractal concept' (Arbix and Posthuma, 1996).

In mathematics a 'fractal concept' represents a complete and radical break with all that has gone before. At Resende, this break was made most clear in the fact that of the 1,500 employees brought together in the plant, 1,300 would be working for eight sub-contracting firms. The tyres and wheels were to be produced and assembled through a collaboration between three companies, Iochple-Maxion, Bridgestone, and Borlen. Rockwell was responsible for the installation of axles and shock absorbers. The transmission units and engines were brought together in a collaboration between Cummings and the German firm MWM. Cabin construction was the responsibility of Tamet and painting that of Eisenmann. The steering and electrical work was done by VDO.

In this new Volkswagen factory therefore a collection of US, German and Japanese companies shared the responsibility for the supply of components *and* the final assembly of all the vehicles produced. In each module, the firm (or firms) responsible for the supply of parts, sub-assemblies and systems stepped into the production operation actually to assemble the truck. Here, the main production corridor became the domain of the sub-contractors. At each step in the assembly process, these companies were to organise the delivery and supply of components *and* co-ordinate the final assembly and installation of these in the vehicles and chassis. As such, the final assembly work completed by employees of Cummings and MWM inside the plant is passed forward to employees of VDO and so on.

In all previous assembly plants (Fordist/post-Fordist/lean etc.) the role of the component suppliers has been to deliver components to the assembly plants. Recently considerable attention has been paid to the role of the supply chain in the management of production and the dynamic processes associated with sub-contracting (see Gereffi and Korzeniewicz, 1994). In the Resende system, a revolutionary change took place in the notion of the supply chain as the component suppliers were

brought inside the factory as assemblers. Here, their role was transformed to one of *sub-contractor* and an involvement in the day-to-day running of their part of the assembly process. In recognition of this, they were directly involved in the construction of the new installation and contributed \$50 million of the initial \$300 million investment in the plant. In explaining this arrangement VW's operational director at the plant, Roberto Barretti, asserted that: 'the idea is like this: the house is ours, the furniture is yours' (quoted in Luquet and Grinbaum, 1996:137).

This description is an evocative one. It also pointed to the strengths and weaknesses of the new arrangements. The modular system drew upon the cooperative strength of the parties to the production process, and to an important extent overcame the diseconomies of coordination associated with arrangements between separate firms. However the firms remained as legally separate entities – they remained juridically independent and as such it proved necessary to divide the floor space of the new plant into separate 'allotments' through which the companies could have their own addresses and legal identity (*O Globo*, 2 November 1996).

At Resende, therefore Volkswagen (the assembler corporation) was to remain outside the direct production process, focusing instead upon strategic functions such as overall vehicle design and architecture, as well as quality, product and marketing policy and sales. However in this system the assembler cannot simply ignore production. It also has to develop organisational capacities which will enable it to integrate a group of supplier companies – now co-manufacturers – into a production unit. As such, VW had a significant administrative staff, with its own office area preoccupied with monitoring the production flows. What this raises nevertheless is the nature of the relationships between the assembler and the component manufacture, legally and within the Resende factory. The modular system with its sub-contracting relationship clearly absolves the assembler from the day-to-day problems of managing labour. But it may also create new problems. To begin with there is the question of quality and quality control. At Resende:

Every lorry that leaves the plant has the signature of an employee. He is the 'maestro', the person responsible for the quality of that product. The buyer of the lorry receives the direct telephone number of the 'maestro' and can complain or discuss doubts for ten years: the period when information about the lorries is kept on file. The responsibility of the 'maestro' is to supervise all stages of the assembly, providing the link between the various partners. ... Every 'maestro' will be responsible for four lorries per day (Neto 1996:3).

The 'maestros' were to be VW employees, recruited from the company's factory in São Bernardo in the 'ABC'. This fact points to the potential vulnerability of the assembler within the modular system. The trucks that leave Resende would carry the VW badge and the company needed to be certain that its brand image would not be tarnished.

This concern to guarantee quality also extended to other issues relating to

financial relationships, delivery guarantees and production penalties and the like. Luquet and Grinbaum (1996:138) followed the negotiations involved in the Resende arrangements and have recorded how:

During one year dozens of lawyers, chosen by VW and the sub-contracting companies, got together to negotiate over the division of risks. A contract of eighty pages was prepared establishing the responsibility of each member of the team. It is a secret treaty, it is in the safe of the eight partners and the competitors want to see it

In time, however, certain things became clear. The component suppliers having contributed to the capital costs, would also contribute to the on-going running costs of the plant. Furthermore, their financial relationship with VW was accounted on the basis of *sales* and not *production*. As such VW absolved itself from many of the financial problems associated with stocks and the like. In the case of Resende VW only paid for the components that made up the truck *once the truck was sold* (Luquet and Grinbaum, 1996).

Looked at in this way, the radical nature of the departure represented by the Resende system takes on a new significance. In 1920, Ford financed his development of the Model A, by passing costs on to the retailer: they paid Ford on delivery and not on sale. The Resende arrangements took this a step further by displacing VW from production altogether, obtaining profit through its badge and through the organisation of distribution and sales.

The Question of the Firm Revisited

In many ways the Resende case brings to mind an earlier period of capitalist development. In his classic article on the rise of factory production, Marglin has argued that the ascendancy of the factory over the putting-out system and other forms of domestic production rested upon the co-ordinating role of the manufacturer and the critical part played in the development of labour discipline by the spatial concentration of production under one roof (Marglin, 1974). Marglin, we remember, asked the question:

What circumstances give rise to the boss–worker pyramid that characterises capitalist production? And what social function does the capitalist hierarchy serve?

His answer was a clear one. It lay not in technical imperatives, but in the need:

For an organisation which guaranteed to the entrepreneur an essential part in the production process, as the integrator of the separate efforts of his workers into a marketable product (Marglin, 1974:61–2)

This process he saw being linked to the removal of the workers' control of production and the resultant process of accumulation through the corporation which proceeded to 'enlarge the means of production'.

Marglin's argument is, of course, just one stop on the road of a discussion on the

boundary of the firm (Buckley and Michie, 1996). In the early twenty-first century it is clear that the conditions he identified as critical have changed. The world beyond the firm is no longer the presence of artisanal home producers but of other hierarchically managed organisations. Nevertheless his account is helpful in problematising the changes being introduced by VW in Resende. Here it seems that the monopolistic position of the VW company and the market dominance affected by the VW symbol, give it significant power in relation to its suppliers and its workforces. In effect, its ownership of the brand, and its knowledge of a mature labour process offered it the opportunity to distance itself from direct production. There are parallels for this of course. Down-town department stores routinely allocate their floor space to other companies. The house and furniture metaphor evokes the franchising arrangements which dominate many branches of retailing. In the past, the gang system in Coventry offers another parallel (Melman, 1957). What is interesting and significant about the Resende case however is that it takes place within the most advanced branch of manufacture and involves relationships between major transnational organisations.

In moving towards an explanation of the Resende case and its overall significance, it is perhaps important to locate the plant in its wider environment. The newly constructed Mercosul market (with the associated 'automotive regimes' offering tax breaks and other fiscal support) created enormous potential for profit making and increased market-share for producers like VW. As an 'indigenous producer' the company was placed in an advantageous position to others and as such the Mercosul offered a landscape within which they could develop at the expense of the Japanese. However there were also considerable risks. The growth in demand for trucks was not as buoyant as those for cars and light commercial vehicles. Whilst the changes under the Cardoso government and the stability of the new currency were positive ones for multinational firms, things could change. Many of the enthusiastic discussions of globalisation and the global firm have underestimated the risks which are presented to capital by issues such as exchange rate fluctuations and political uncertainties. In this spirit of corrective, Peter Drucker has expressed the view that:

Most of the present manufacturing multinationals in the course of the next ten years will go bankrupt over foreign exchange losses (quoted in Jackson 1999:14).

Writing on Brazil, Richard Lapper has noted that at a time when enormous amounts of fixed capital was being ploughed into the country as a result of its neo-liberal policies, portfolio investment funds remained cautious. He quotes one leading fund manager saying that 'institutional investors have an in-built prejudice against Latin America. It is still the lost continent' (Lapper, 1998:1). Concerns such as these could easily have played a part in VW's attempt to reorganise its *production* operations by sharing the investment *risk* amongst new-found partners. In fact, this kind of

consortium could well emerge as an appropriate mode of risk sharing amongst companies in an age of increasing uncertainty.

There were also other advantages of the modular form to Volkswagen. The company had experienced difficulties in the ABC district in its relationship with its component suppliers and the organised workforce. Such had been its experience that it was prepared to consider ways of stepping back from the work place, handing it and the problems of labour discipline, to a new group of international supplier companies. Paulo Butori, President of the Brazilian Auto-Parts Association was clear about the advantages the new system afforded VW:

By being free to focus only on vehicle design and how to sell it you get the most lucrative parts of the business and pass the onus of production on to the supplier. The assembler's great worry is production ... this way, the assembler keeps the two lucrative areas and passes on his greatest headache to the supplier ...

However:

once you let the parts supplier into your factory, then you create a great inter-dependence. It's like a family, you can't easily throw them out of the house. So you need to think very carefully before you invite a new producer to work in your factory because you then have to share everything (quoted in Arbix and Posthuma, 1996:7).

It seems that VW has thought very carefully about this new arrangement, and it is also clear that the component suppliers have bargained hard. One of the gains for them has been a guarantee of a long-term supply relationship. They have made it clear that with their financial commitment to the plant, they will not easily be removed.

This relationship between VW and the component suppliers has indeed proven to be more problematic than the company imagined. Its early productivity record was not remarkable. In 1998, *The Economist* noted that:

When the plant opened in mid-1996, VW promised that it would set new standards for productivity. In fact, the factories productivity has turned out to be less than half that of comparable American and European plants. VW officials say that this is partly because truck sales have been disappointing, but it is also because quality at the plant is so poor. A third of the vehicles built at Resende need more work when they come off the line. VW admits it may have been too ready to give responsibility to its suppliers. But the firm insists that Resende can still meet its goals without abandoning the new approach if its managers supervise the contractors more closely (5 September, 1998: 60).

This is to raise another general issue relating to the modular concept of production – the question of labour and of labour discipline.

The Question of Labour and The Trade Unions

Public discussions in Brazil at the time the plant opened emphasised its

modern nature and the contribution that it would make to the development of automotive production techniques. The statements by the company and the government were redolent with a rhetoric of transformation. For VW the Resende factory made clear that it was: 'leaving behind the era of Fordism, which is already obsolete. Resende is the paradigm of the twenty-first century' (*O Globo*, 2 November 1996). The Brazilian President added that, in his view:

The company is betting on its capacity to revolutionise production. We are leaving behind that history in which men became machines like Charlie Chaplin showed so well in his film *Modern Times*. Today, men command machines (*Jornal do Brasil*, 2 November 1996).

In spite of this however, the technological developments within the plant, and the changes in established work practices were minimal. We had begun to notice that all published accounts of the interior of the factory focused not on technology (robots, computers and the like) but rather on the surrounding environment of the work stations. Here, the language is anything but revolutionary. While corporate rhetoric looked forward to the twenty-first century, these factory accounts returned to many of the behaviourist depictions of workers popular in the early part of *the twentieth*.. Thus VW's manager, Roberto Barretti has claimed that 10 per cent of the investment in the factory was directed at 'the comfort of the employees'. In her visit to the factory, Germana Moura focused on these issues pointing out that:

At first sight it doesn't even look like a high tech factory. Instead of machines and robots the visitor encounters the hills of Paraíba valley, and if he is lucky he can even see the sun invading the assembly line. But this is just one of the details that gives distinctiveness to this new unit of VW in Resende. All of the environment was projected to give the feeling of liberty to the employee. The objective is to avoid fatigue and with it the loss of productivity (*O Globo*, 2 November 1996).

For its part, the company has emphasised how the process has been organised in ways which minimise the amount of bending required of the operatives, and how the shop floor temperature is regulated through an extremely sophisticated system involving sixteen air conditioning units, each weighing two tonnes. The walls are painted white rather than the conventional grey and designed to reduce the levels of noise.

In many ways therefore, the public emphasis on technology and newness and the novel attempt to, once again, mark the end of Fordism, missed the main significance of the Resende case. In relation to labour, for example, VW's concerns were quite orthodox. Arbix and Zilbovicius (1997: 469) have noted the lack of any sign of innovation in the organisation of work groups or that, in the scheduling of group activities, concern has been taken to develop autonomy of the operators. In their view, the entire concept of the plant was based on a conventional flow production system which makes no space for the involvement of the worker or the trade union in its configuration or functioning. Interestingly (given the emphasis given to human resource management in the literature) worker-involvement was not mentioned in any of the corporate discussions which related to the fractal concept at Resende.

Although team working was introduced early in 1999, our examination of the records of the trade union show that no talks took place in the first three years of the plant on issues other than wages, benefits, and working conditions. There is no mention of any discussions relating to the production process or styles of management.

VW and its partners however made considerable efforts to ensure that the new factory recruited skilled employees who would respond favorably to training and induction to its new working arrangements. In Brazil, a chain of technical schools (*Serviço Nacional de Aprendizagem Industrial* – SENAI) existed for the dedicated provision of vocational courses. One such school existed in Resende and VW made extensive use of this organisation. In our interview with its Director, Ari P. de Almeida in May 1999 he explained how:

They wanted to know how we could help them. It was interesting work because it involved a different philosophy – that of the modular consortium as a production system. It was different from São Bernardo. For us it was a positive experience and the largest part of the workforce at VW were students of SENAI.

The companies subsequently established a training partnership (*convênio*) with SENAI setting up a Centre for Automotive Technology to train new and existing workers in new production processes.

Within the factory VW (while operating the modular system) seems to have been aware that disparities between the workers of the different companies might be a source of conflict. With an eye to this it introduced a standardised dress code. All employees in the plant, including the executives wear the same uniform. The trousers are dark grey and the shirt light grey. The only difference between them is the logo-mark of the firm that is on the right pocket of the shirt. On the left pocket all have a daisy, which is the symbol of the consortium.

VW was also concerned about the wage issue. To avoid disputes, the company insisted in 1996 that all the firms (VW included) would share a common wage and benefits agreement. In the view of VW's plant manager Luiz de Luca: 'If you start with wage differentials, the plant stops the day after' (quoted in Neto, 1996:3).

In moving to Resende, the Company did not attempt to hide the fact that part of its plan focused on the establishment of labour relationships different to those of the ABC region of São Paulo. Volkswagen carried out a survey in Resende in order to scale its wages to those of other companies in the industrial district of the region. According to its Industrial Director, Luiz de Luca, 'we would not want to pump up the market'. He was particularly concerned to emphasise that, on this green-field site, the company was determined to avoid 'the bad habits of São Bernardo', where 'it is not possible to negotiate (with the trade union)'. Claiming that 'everyone was getting out of the ABC region', he said that there was 'perfect harmony' with the metal-workers trade union in southern Rio de Janeiro State (*Folha de São Paulo*,

9 December 1996). Resende had a further attraction of being a centre for the *Força Sindical* trade union. This union was seen to be highly responsible and conservative in contrast with the socialist *Central Única dos Trabalhadores* – CUT (Unified Workers Confederation) that dominated the ABC district. VW considered the *Força Sindical* to be more 'affable' with policies that were more in sympathy with the aims of the company. In this new location it was assumed that the trade unions and the workers would be much less experienced in the issues affecting the industry and more receptive to business initiatives.

For its part, the metal-workers' union viewed the arrival of the Volkswagen plant in Resende as an important opportunity to regenerate a depressed labour market. In VW they saw the potential for employment expansion in a growing industrial sector, opening up more jobs for local workers and expanding the union's membership. Luiz Rodriguez, its president in 1997, was openly appreciative of a 'flagship company' moving into the region. There is a suspicion that this enthusiasm helped to bolster the impression amongst VW executives that *Força Sindical* would operate as something of a 'house union' at Resende, following the company's lead on all matters. Its inexperience of modern techniques of vehicle production, together with the novelty of the modular production system supported this view. However the union had had experience of industrial closures in the steel industry and this seemed to have equipped local organisers with an understanding of the problems and issues involved in industrial change. They were particularly aware of the significance of the wage rates to the company and the fact that the wages at Resende were lower than those paid to workers doing similar jobs in São Paulo. According to the metal-workers union leader we talked with in 1997: 'wages are low in this region. The average pay here is R\$ 400, while the average in São Bernardo is 60 per cent higher'. From the beginning therefore, it sought to increase the rate in line with these operating in the ABC district.

This notion of 'parity' is a powerful one and has been seen as critical by automobile workers throughout Europe and the USA. It was a clear concern for the union in Resende, and during the late 1990s became seen as a critical issue for the unions in the ABC district also. For these unions, the dispersal of plants away from the ABC was seen to be part of a low-wage strategy for the industry. In 1999 the two main union federations (CUT and *Força Sindical*) joined forces to draw attention to the fact that while wage levels in the ABC stood at R\$1,500 a month, those in Fiat in Minas Gerais were R\$800 and at Resende R\$600. This demand for greater parity produced a firm response from the companies. VW was centrally involved in this opposition and its Vice President for Human Resources Fernando Tadeu Perez put it like this;

The companies will not accept a proposition for a unified national wage ... The trade unionists should forget the idea of regulating wages taking the ABC as a basis. This is not going to happen. This would kill the Brazilian automotive industry (*O Globo*, 26 August 1999).

However there were aspects of the ABC system which VW was concerned to establish in Resende. Most notable was the hours bank arrangement which it had agreed with the trade unions at São Bernardo. The 'hours bank' operates with an understanding of an average working week that the company can reduce or exceed in relation to demand without penalty to either side. The workers would not lose wages in their short weeks nor would the companies be responsible for premium payments in the long ones. The trade unions at Resende were unhappy with the kind of arrangements proposed for their plant. VW wanted the flexible arrangements to cover as many as 300 hours. This was rejected and after a series of conflicts and industrial stoppages (culminating in a week-long strike in August 1999) the size of the 'bank' was reduced to 150 hours.

A further question which troubled the trade union related to the operation of the modular system within the factory. There was a worry that the system, in its very nature, would produce vertical divisions within the workforce that would operate in ways which prevented successful plant-level bargaining. This suspicion was confirmed at one point when the company indicated that they were prepared to consider a wage increase for VW employees but not for the assembly-line workers employed by the other firms. However this approach proved unsustainable. What VW learned in these negotiations was that in order to guarantee consistent production in the plant, it had to 'hold the ring' on plant-level wage discussions. As such the company increasingly took the role as lead wage negotiator for the consortium as a whole. Furthermore, they had to adjust their stance with relations to the '*comissão de fábrica*' (factory committee). In line with the logic of the modular concept it had initially refused to establish formally the collective bargaining institutions that had operated in its ABC plant considering that many of these arrangements would be the purview of the individual members of the consortium. However this proved problematic, and informal discussions and negotiations developed across the plant to the point that a *de facto* factory committee existed. In 1999, and after a strike, the companies agreed that they would formalise this arrangement.

This process of negotiation (and the attendant patterns of collective action by workers *across the plant*) had important consequences for the operation of the modular system. In the interviews we have conducted with workers from the Resende plant it has been clear that they have developed a clear identity as VW workers. While the rhetoric of the company insistently draws attention to the modular system (*Consórcio Modular*) and its importance, the workers and their trade union have emphasised another reality. In their view VW is the key player and their own particular employer has a minor part to play in the general operation of the plant and its future. In answering our questions and in natural conversations they assert their own perception of their position in the factory as *de facto* employees of the German multinational. This also affects their position in the community. As one

of them put it to us: 'Generally people say "wow – this guy works for VW; he must have a good job"'

The union leaders emphasise the strategic significance of this interpretation. In their view VW determines the rules of the consortium and in their negotiating strategy they have been keen to use the owner of the factory against those who simply own the furniture. Nevertheless they recognise the real problems for defending workers' rights created by the modular system. Although VW dominates the other partner firms in relation to wage bargaining, this hegemony does not extend to the day-to-day treatment of workers in the plant. Here, it seems there are real differences. In the view of the local trade union leaders we talked with in 1999:

There are eight firms, eight different heads, eight different philosophies of work. Some have a philosophy of understanding the workers, of answering to workers' demands; others are hard – they don't want to give anything ... If it was only VW it would be easier. But the fact is that VW is only the 'chief head' (*cabeça chefe*) and the others have a say.

Furthermore, whilst relationships between the partners were established in their legal document this did not cover every eventuality. This made for difficulties on issues that required joint decisions affecting the welfare of all workers across the plant. This was the case in relation to the demand for the provision of buses for workers who lived some distance from the plant. This issue was raised repeatedly by the union in 1999 but the companies were incapable of coming to an agreement on who paid which part of the costs, each blaming the modular system for the delay.

The makings of a new production system?

Our consideration of the Resende plant and the general significance of the modular production system will benefit from once more locating the plant within its wider context. It seemed possible, in 1996 to think of the Resende development as untypical. Furthermore it seemed that while it might be possible to extend the concept to other truck producers in the region it would be impossible to use it more generally as the basis for car production. Here it was thought that a number of factors (the larger numbers of components and component suppliers; a more complex and dynamic labour process; issues of corporate secrecy etc.) would militate against the level of cooperation and trust required within the consortium. However, recent developments have tended to strengthen the view that Resende may be more than a one off, and represent one acute example of a more widespread development within the region.

In 1998 Chrysler opened a truck plant in Curitiba, 200 miles South of São Paulo in the state of Paraná. The plant produces a version of the Dakota pick-up truck and it has incorporated elements of the modular system. Unlike Resende, the 'modules' are located in the suppliers' own factories. So, the Dana Corporation set up its own

plant a mile from the assembly plant. In contrast to its operations in the USA, it produces the chassis (redesigned as a 'rolling chassis') with a considerable number of the components added. Altogether the chassis assembly makes up over a third of the total production of the Dakota. As such:

The chassis arrives at Chrysler's plants with wires and hoses already in place – even the tyres are mounted and balanced. When it rolls off Dana's truck and on to the assembly line, it is quickly joined to a body and 'stuffed' with an engine.

A similar process has been applied to seat production and with it the assembly of complete 'seating modules' by another US supplier (Lear Corporation) located nearby.

Such extensive sub-contracting is attractive because it allows Chrysler to save money by building a smaller plant, holding less stock and shifting more of the risk (though presumably also more of the profit) to suppliers. (*The Economist*, 5 September 1998: 60)

Similar changes have been introduced into VW's new Golf plant, also in the state of Paraná. The configuration of this assembly location has seen it identified by the company as the 'Y' factory. Thirteen component suppliers are installed in the leg of the 'Y' where they produce the platform of the car. This is delivered to the main paint and final assembly plants that make up the two arms of the 'Y'. The company's communication department and laboratories make up the space at the center.

In the view of *The Economist*, more dramatic (and more far-reaching for the industry) have been the developments associated with the new plants being built by Ford and General Motors. Here in two projects, imaginatively termed 'Amazon' and 'Blue Macaw' the two major world assemblers are also introducing aspects of the modular system. Both plants were initially projected for locations in Rio Grande do Sul, but Ford dramatically changed its decision in favour of a lucrative arrangement with the state of Bahia in the poorer North East of Brazil. This change of plan also served to focus attention upon Ford's plans for its Brazilian operations and how these may affect the changing shape of the world automobile industry. A spokesman for the company indicated clearly that: 'we want to try different manufacturing methods in Bahia'. In its plans, only twelve to fifteen primary suppliers will serve the Ford plant. This represents a tenth of those in a conventional plant and is associated with a multi-tiering of responsibilities along the supply chain. These first line component corporations will contribute a third of the one billion dollar cost of launching the Amazon project. Unlike the Curitiba development, they will actually produce their modules on site before delivery to the final assembly plant. As in Resende these key suppliers will themselves be giant transnational corporations. Although full details of the plan are unclear it is widely assumed that Comau (the assembly systems specialist arm of the Fiat group) will take responsibility for body assembly and also for other routine property management and maintenance tasks.

One of the suppliers has been quoted as saying that 'Ford Amazon is the model of how Ford is going forward. Outside companies will take responsibility for operating large parts of the facility.' In a way that echoed with our earlier assessments of the Resende development, another supplier considered that 'the manufacture of cars will be a declining part of Ford's business. They will concentrate in future on design, branding, marketing, sales and service operations.' In its assessment of these developments, *The Financial Times* considered that the strategy for the Bahia plant 'could signal the group's gradual withdrawal from final assembly as its core activity – transforming Ford from a car-maker into a global consumer products and services group' (4 August 1999). This could be seen to build on previous discussions about the car company's activities in the leasehold market and the growing significance of financial activities to its overall operations (see Froud, Haslam, Johal and Williams 1998). The importance of these developments for the theory of the firm and for the notional distinction between service and manufacturing organisations is clear.

More specific are questions which relate to production systems and the role of the Brazilian industry in these developments. Ulrich Beck and others have talked of the 'Brazilianisation' of the West's economy, drawing attention to its flexible labour markets and large informal economy (Beck, 1999). The Resende case may signal a rather different side to this Brazilianising process. In all public discussions that we have noted, the companies have drawn attention to the fact that the innovations in their Brazilian operations need to be appreciated for their 'conceptual' rather than their 'technological' development. Here the stress is twofold. In the first place, and across the region, all of the assemblers are involved in a radical renegotiation of their relationship with their component suppliers. This most usually involves spatial concentrations in new sites and the involvement of the component suppliers in a considerable amount of assembly work. At Resende this takes place in the assembly plant itself. More generally it takes place in the enlarged factories of the component suppliers that operate as a production bridge between lower-order firms and the main assembler. These sub-contracting suppliers are usually involved in a detailed legal and financial relationship with the assembly firm that seem to involve the establishment of medium to long-term production relationships.

The role that labour is seen to play in this new system is important and varies from orthodox interpretations of labour relations in the evolving auto industry. In Brazil, the new assembly plants are much less automated than their counterparts in the OECD states, employing far fewer robots. In this regard, Resende is not atypical. This reduction in fixed costs however has not been associated with any fall off in labour productivity. This was put clearly by Herbert Demel the President of VW in Brazil in an interview relating to the company's strategy:

In the new factories there are opportunities to apply the best conceptual basis for production. The operational experiences in Brazil is done though conceptualisation

rather than automation. In most of the cases, the robots are too expensive and they look less important than trained workers and a network of adjusted component suppliers (*Gazeta Mercantil*, 11 August 1999:1-c).

He made clear that their investment was not in fixed capital but in the training of workers and the increased control over and involvement with the suppliers. This view was supported by Dennis Kelly, President of Chrysler of Brazil: 'When I think about technology I don't think in terms of robots but in processes of quality training and concept' (*Gazeta Mercantil*, 11 August 1999:1-c).

Within this framework it seems that productivity levels are being reached which exceed those achieved globally. Within Mercedes for example Luiz de Carvalho the Director of Manufacturing has asserted that: 'We only use robots in unhealthy places in the plant or in computers. All internal communication is face to face. In assembly lines the communication is visual' (*Gazeta Mercantil*, 27 July 1999:1-c). He was talking, as he explained, about the fact that his Brazilian operations had improved their productivity levels by 43 per cent in the last four years and had achieved savings in stocks of \$130 million.

The full and considered account of how this pattern of labour discipline is achieved will require further detailed research. At the moment, it seems that in the new factories, labour compliance and involvement is being achieved more through the wage contract (with the hours bank) and a strong emphasis on training provision than through team working and other advanced forms of human resource management. This in turn is facilitated by the co-existence in Brazil of an advanced capitalist infrastructure, good schools of technical education and incomparable levels of poverty. For many people the car industry can be seen as the way out. In Resende when we asked the workers whether they had positive feelings about working in the plant they often responded in this way:

Yes we are proud because it is a model factory where we work because we need the wage to keep our family. We hope that in the future the company will improve and give better wage and social conditions for every employee.

It is this complex Brazilian reality which provides the social and economic conditions for rapid organisational innovation. Perhaps this is what VW had in mind with its slogan for its new Golf model in Brazil. *O carro dos sonhos dos brasileiros. A fábrica dos sonhos dos alemães* – 'A dream car for Brazilians. A dream factory for Germans'. The implications for the industry at large could be portentous.

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