

Implementing the 'Just in Time' Production System in the Brazilian Car Component Industry

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Introduction

There is a growing consensus in the literature on the emergence of a new production paradigm, termed by some authors as flexible specialisation. This concept includes new forms of factory organisation — based on Japanese Just in Time (JIT) techniques — and also new microelectronics technology.

The JIT system has several features that must be implemented to achieve the best results. For this reason, JIT is not as easy to introduce as some authors suggest. The objective of this article is to highlight some of the characteristics of JIT that affect its implementation, and to describe the process of introducing this technique into the Brazilian car components industry. I conclude that Japanese organisation techniques are transferable, but they require a full comprehension of all components of the JIT system, and a long-term plan for implementation.

The Emergence of a New Paradigm: Flexible Specialisation

The primary reason suggested by many authors to explain the demise of the mass production paradigm is market saturation, implying the need for diversification to achieve a more demanding consumer [Kaplinsky 1984; Tolliday and Zeitlin 1986]. Diversity implies flexibility in the production process.

The flexible specialisation concept is linked to the following features: small firms, cooperative consortia with joint facilities, specialisation in niche markets, flexible technology and Just-in-Time system of intermediate delivery [IDS 1987]. Tolliday and Zeitlin [1986] point out that the Japanese system of production can be termed as flexible specialisation, which contrasts with the characteristics listed by IDS. Perhaps the Japanese production system — in sectors like car assembly — should be defined as 'flexible mass production', combining microelectronics automation and new methods of production management.

It is necessary to add that flexibility itself — with the use of general purpose machinery producing a wide range of products — does not represent a new paradigm. Small-batch production factories are already producing in this way, using general-purpose

machines and a highly-skilled labour force. The novelty in the new paradigm is the link between flexibility and effectiveness, provided by microelectronics automation and new forms of organisation.

Some authors recognise that reorganisation is perhaps better suited for light assembly and job-shop engineering firms than it is for the mass production of complicated final products such as automobiles [Bessant and Haywood 1986]. In this sense, it can be said that perhaps the new modernisation will not in fact diffuse as quickly in mass production factories as a whole. Rather, it will diffuse faster in factories that have been producing with flexibility, in small batches and with a high diversity of products, but without both productivity and responsiveness to market changes. On the other hand, it has become increasingly obvious that introducing sophisticated integrated manufacturing systems into plants that operate inefficiently does not eliminate the original problems. The majority of benefits achieved by users of the new technology come not from the technology itself but from the rationalisation of procedures and organisational changes [Bessant and Haywood 1986; Hoffman 1989].

Another important point is that costs involved in introducing new work practices and in reorganising production are relatively low in comparison with the costs of introducing new technology. According to this logic, for Western countries — and especially for developing countries with their chronic lack of capital — the path to follow is to implement Japanese management techniques immediately. The question is: are JIT techniques easy to implement? Does low capital cost necessarily represent low risk?

This discussion points to risk in implementation. Many authors argue about the degree of risk involved. According to Hoffman:

there is no mystery behind how these practices work. Indeed there are numerous 'how to do it' cookbooks available that detail and describe in a very practical fashion how firms should go about introducing the new practices. Moreover, most management consulting firms can now provide specific advice on the practices as well as giving 'how-to-do-it' seminars . . . In short, the new practices are codifiable and accessible.

[Hoffman 1989:54]

In order to discuss the implementation constraints of these techniques, the following section highlights some features of the JIT system, especially those related to the management of the production process.

The 'Hidden' Components of the Just-in-Time System

The main aspects to analyse in the Japanese approach are the management of the workforce, the machinery, the production process, the approach to quality and the management of the supplier relationship. The first issues can be classified as **internal** Just-in-Time, while the relationship with suppliers is the **external** component of the Japanese philosophy.

In the management of the production process, some characteristics should be highlighted:

— The shop floor labour is in cells, rather than in specialised departments. Each cell includes different machines and can produce a family of similar components, reducing the transfer of components through the factory, facilitating quality control and reducing the set-up time to change production. It requires multi-skilled workers within each cell. The cell itself can either be automated or not.

— Levelled production — the attempt to produce every day the product mix planned for the month. This implies mixing different final products in the same assembly line and at the same time.

— The utilisation of *kanban* cards to communicate the production plan and material transfer to the shop floor, according to a 'pull philosophy' from the final assembly to the preceding sectors.

Hoffman points out that there are a variety of other steps that need to be taken before a company can operate JIT effectively, such as cutting the sizes of batches through set-up time regulation, streamlining plant configuration and Total Quality Control (TQC) approach [1989:38]. The same author affirms that contrary to the common impression given in the literature, *kanban* is only 10 per cent of the new practices — and for most companies it is the last 10 per cent to be worried about after all the other details have been attended to. The reason for this is probably the fact that *kanban* is one of the most visible parts of the JIT system. In fact, the product oriented reorganisation of job-shop production into cells seems to be the first step in evaluating productivity by using effectiveness in supplying demand. This contrasts with an emphasis on production volume, the typical method applied in old functional layouts.

The point to be made here is that the real implementation of the Japanese system is, in fact, a complicated process, and requires a long-term plan. Hoffman seems to confirm this point, by stating that 'we should make clear that reorganising job-shop

production along flow lines can be a complicated business that can only be done in stages, often over a considerable period of time . . . ' [1989:39]. The layout transformation begins with the definition of families of parts. It can be a fairly difficult process in an environment that produces hundreds or thousands of parts, and has been producing according to functional sectors. After families of parts definition, it is necessary to redesign some parts, tools, tasks, skills and the production planning system itself. The installation must be done in stages, transferring machines according to the new layout with the minimum disturbance of production. According to many authors — for example Suzaki (1987) — only after both layout and levelled production implementation is it possible to take full advantage of the 'pull' system provided by JIT.

The Decision-making Process of Modernisation in the Brazilian Context

First, it is important to discuss the relative position of Brazil among the developing countries. The establishment of a national automobile industry began in the 1950s, and Brazil now has an automobile complex capable of producing domestically more than 90 per cent of the car components required.

Despite the fact that installed capacity in Brazil can be considered an advantage, at the same time it implies extra difficulties in the implementation of new technologies, due to the 'brownfield' phenomenon. Womack (1987) mentions that in coming to America, the Japanese have argued that it is better to knock down old facilities and social structures and to begin anew with 'greenfield' facilities. This is an important issue to discuss in the Brazilian context.

The economic instability of the country seems to discourage firms from investing in modernisation, rather than contributing to the search for flexibility. According to the survey conducted by the author in the Brazilian car components industry, the management decision-making process contradicts the theory that market fragmentation should increase the pace of adoption of new modernisation techniques. Some managers have argued that market stability is required to implement microelectronics automation. This is in contrast to the view of most academic observers that the flexibility provided by microelectronics automation reduces the risks in an unstable economy. It also contrasts with many accounts of the Japanese experience [IDS 1987].

Three explanations can be given for this. First, considerations about quality improvements seem to be the primary concern in Brazilian managers' minds. This is due to the requirements of export markets. Second, managers do not always consider the increase in machine utilisation provided by flexible automation,

perhaps because flexibility of the whole process is not easy to achieve. Finally, during an unstable economic period, decision-makers are not inclined to take any kind of risk, and this includes investing in modernisation. Most component firms in Brazil now set a two-year pay-back period in their acquisition of new equipment. This makes the majority of acquisitions unfeasible.

Thus the greater capital costs and complexity of the new technology work strongly against their introduction in NICs. In addition, Brazil's market reserve policy for electronic capital goods is another constraint because it increases capital costs. Indeed, the majority of components factories visited complained that the cost of microelectronics equipment in Brazil was much higher than that of imports. Under the market reserve policy, Brazilian-produced equipment prices are between three to five times higher than in the international marketplace. After more than four years of market protection this difference seems to be increasing, rather than declining.

Brazilian inflation (about 20 per cent per month in mid-1988) also affects the process of modernisation in equipment or new managerial philosophies such as JIT. Despite the fact that the real interest rate has been kept positive, the ever-present fear of hyperinflation leads some firms to speculate in the financial market or in speculative inventories. This factor poses an extra constraint on investing in modernisation, and especially in JIT techniques.

Finally, the political and economic instability of Brazil makes internal conditions very different from other countries that compete in the international market, such as Korea. These countries have a strong advantage over Brazil in attracting risk capital from developed countries.

Modernisation in the Brazilian Car Components Industry

The following comments are supported by a survey of the 15 major suppliers of a transnational automobile company. Two assemblers were also visited.

Ten of the 15 firms visited have implemented CNC machine tools. Two machine centres and one FMS were also found in the sample. The quantity of CNC machines per firm, however, is minimal: it represents only 4 per cent of the total equipment installed in the firm with the greatest quantity of CNC in the sample. The conclusion is that the diffusion of microelectronics automation is still in its infancy in the Brazilian auto components industry, although the majority of industries visited have at least one CNC machine tool.

On the other hand, nowadays there are plenty of discussions, seminars and attempts in Brazil to implement the Japanese manufacturing approach.

Some local firms seem to be conscious of the need to first rationalise and simplify the production process, paving the way for further microelectronics automation. Despite this fact, a great number of the firms interviewed have no long-term plan to implement modernisation.

Those firms interviewed emphasised that the primary purpose in introducing modernisation was improvement in quality, that is, to permit repetitive and homogenous production according to international standards. This is due to increasing export orientation in this sector. Firms seem to be more conscious that the strategy to adopt to compete in the international market can no longer be based on low wage, high labour content [Jones and Womack 1985].

Modernisation is also affected by the productive chain constituting the automobile complex in the country. In this way, the local car industry directly pressures its suppliers to implement Statistical Process Control (SPC) to control product and process quality. On the other hand, firms also indicated that the auto assemblers are demanding more frequent deliveries, and unexpected schedule changes are becoming more common. In fact, the auto industry is implementing only external JIT. Due to its strength in the productive chain, it is possible to transfer its component inventories to its suppliers — the auto components sector. The auto components sector, however, lacks the same strength to transfer its own inventories to its suppliers. The sector's only alternative is to implement internal JIT in order to support daily deliveries.

It should also be pointed out that unlike North America and Western Europe, neither the car industry nor the components sector in Brazil are trying to reduce the number of their suppliers. Thus, they are not adopting the approach of establishing closer and more collaborative relationships with suppliers, turning towards single-sourcing and long-term contracts. This situation reflects the difficulty in adopting responsibility through the industrial complex as a whole.

In terms of internal implementation of JIT by the components industry, the first step adopted by almost all industries visited was the introduction of *kanban* cards — one of the mechanisms utilised in implementing JIT production on the shop floor. As in other countries, some firms in Brazil had been taught, until recently, that *kanban* and JIT were almost the same thing. In the few firms that had introduced the cell layout before implementation of *kanban*, the results achieved are much better. In fact, these firms declared that the *kanban* system is really effective only in those parts of the production process which are organised in cells. If the layout is functional, then communication between work points is weak and often the distance to the next work station is large. The conclusion is that a change in the communication

system (*kanban*) without any change in the logic of production has almost no impact in terms of inventory reduction or flexibility.

The fact that multi-skilled workers are required only on a shop floor based on cell configuration means that in the Brazilian car components industry there is no trend yet in this direction, except in work stations that were automated with microelectronics equipment. There is a trend, however, to increase the responsibility of the workers in terms of product and process quality.

Finally, it must be pointed out that there is no evidence that JIT in Brazil has improved work conditions. On the contrary, some managers have declared that the system permits better control of the workforce and the speed of production tends to be faster. Machines also tend to be closer together in a cell configuration, and this has unfavourable consequences for noise and heat. Hence this would throw doubt on the views of some that the new capitalist labour process is inherently more favourable to the interests of labour.

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