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The VW Resende (Brazil) plant modular consortium SCM model after 5 years of operation¹

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Track: Global Supply Chain Management

Abstract

This paper discusses the modular consortium model adopted by Volkswagen in their trucks and buses plant in Resende, Brazil, in which only big module (large sub-assemblies) suppliers carry out assembly operations. Based on both literature review and field research, some considerations on core competencies and strategic positioning are developed. We argue that the choice for the modular consortium was made because of the urgency in building a new truck plant after Autolatina's (a joint venture between Ford and Volkswagen in Latin America which lasted from 1987 to 1995) end and because VW did not have the necessary core competencies regarding the production of the truck modules, having thus decided to take advantage of well established suppliers' competencies in the new plant.

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Introduction

In 1996, when the Resende Volkswagen plant, the first world wide to adopt the Modular Consortium model, was inaugurated in the State of Rio de Janeiro, Brazil, the world's attention of the operations management community centred on it. The object was to take to the extreme a world trend, which already had existed for many years, in the car assembly plants to reduce their supplier bases to smaller number of partners, with whom they would establish longer relationships that would be more concentrated on co-operation than on conflict, delegating to each of the partners growing shares of responsibility, both in the production as in the project of parts and assemblies. The extreme to which VW took these ideas meant a model in which, at the Resende truck and bus greenfield plant, VW would have business relations with only 7 suppliers of large systems (or modules), who would be responsible for both their respective supply chains, as for the assembly of the large component modules of the vehicles in the VW assembly line. Thus, no VW employee would in any manner what so ever carry out any production or assembly operation.

After four years in operation, on the one hand, it is seen that the model initially conceived underwent alterations. On the other hand, the latest plants of Volkswagen and other car assembly plants in Brazil have been designed according to a different model – that of the industrial condominium, which maintains the idea of large modules supplied by partners with neighbouring units, however, the one who executes the assembly itself (or a substantial part of it) in the vehicle is the car manufacturer using its own staff.

This paper's object is to analyse the Modular Consortium model and its implications, advantages and disadvantages, as far as the make or buy strategy is concerned, taking into account the Company's core competencies.

As a result of the importance that the automobile industry represents, both economically and in relation to the influence which it has on other areas of the economy (Womack, Jones and Roos, 1990), the arguments herein can be used as a reference for other industries. There are initiatives (or intentions) of adopting modular models in Brazil, for example, by Atlas-Schindler (elevator and escalator manufacturers), and, interestingly, by Mc Donald's fast-food chain amongst many others. However, what draws our attention is that decisions are often taken based on belief or instincts, without the issues having been analysed objectively. One of the objects of this article is to subsidise the studies of the potentials and limitations of these models of configuration of supply chains by decision makers, who are in charge of the difficult task of defining the design of their operational chains, according to a plurality of views: logistics, relationships and confidence between clients and suppliers, among others.

Make or buy strategy versus core competencies

Traditionally, the make or buy decisions were taken based on the marginal cost concept. If the calculation of the marginal cost to carry out an activity is less than the marginal cost of outsourcing, this would imply that it is better to execute the activity in house. If, on the contrary, the marginal cost of outsourcing is considered less, it would be recommended to outsource. Little or nothing was said about costs other than the marginal operating costs in this type of decision.

As from the 90's, particularly as the result of developments described in publications such as "*Competing for the future*" (Hamel and Prahalad, 1994), it became obvious that in the make or buy decisions more strategic concerns than only those of the marginal costs involved should be considered: one of which should be with the so called core competencies, which should not be outsourced.

Hamel and Prahalad (1994) define competencies as a group of skills and technologies, resulting from a series of apprenticeships that took place, crossing the boundaries of operating

and functional teams and areas. For the competency to be considered a core, three features are necessary:

1. A contribution “disproportional” to the value perceived by the client.
2. Competitively alone or exclusive, producing an edge over the competition.
3. Expandability or a potential opening towards future markets.

Hamel and Prahalad (1994) also explain that the core competencies are neither the company’s physical assets nor a brand name. In addition, the core competencies are not a way to defend vertical integration. What the Company must try to control are the competencies that make the greatest difference to the value offered to the customer. According to the authors, Nike, for example, possibly does not sew its tennis shoes, but controls competencies in logistics, quality, design, product development, athletes’ statements, distribution and merchandising. According to Hamel and Prahalad (op. cit.), there is a trend of companies to leave the vertical integration model in order to adopt the virtual integration idea. In a coalition or strategic relationship chain, each company member would specialize in a few core competencies.

In the building and design of supply chains that imply coalitions between companies, two authors with interesting contributions are Jarillo (1993) and Fine (1998). Jarillo (1993) proposes the concept of strategic supply networks as an emerging solution of organizing a coalition of companies: *‘Strategic networks are deliberate long term arrangements, between different but related organizations having in view profit, which allow these organizations in the chain to gain or sustain competitive advantage vis-à-vis their competitors outside the chain, by optimising the operating costs and minimizing the co-ordination costs’* (Jarillo, 1993).

This solution would add most of the advantages of the vertical integration, such as planning efficiency, direct co-ordination between the parts, reduction of transaction costs and unity of purpose. It would also add some of the subcontracting advantages, such as efficient size for each activity (efficient scale), maximum motivation and promptness in answering to new demands. The base of all the success of the relationship between the companies in this model is co-operation. However, co-operation is only attained with the chain’s leading company’s work and effort to conquer the confidence of suppliers and clients as time goes by.

Establishing a strategic network allows the company to launch multinational bases without the need to own all activities. The strategic decision of remaining local or expanding its limits globally depends on the balance between transaction costs and integration costs, for both tend to be greater when the countries’ commercial frontiers are crossed (figure 1).

Transaction Cost	Low High	Strategic Chain	Subsidiary / Integration
		Export / Subcontracting	Indifferent
		High	Low
		Integration Costs	

Figure 1 – Co-ordination options (adapted from Jarillo, 1993)

The case of Resende’s Modular Consortium is an example of Strategic Network – very high integration costs (would imply developing the technology necessary to produce the modules, not dominated by worldwide Volkswagen, as up to today the company only handles light vans in Europe, Brazil being its sole operation with trucks in the world, except for Scania’s operation that was recently acquired) and very high transaction costs, if it depended on, for example, quotes to purchase its modules, in a traditional supply approach.

According to Fine (1998), the dynamism of the new economy generates an environment of continuous changes at growing speed, where the competitive advantages are more and more

transitory. Every industrial sector responds in a different way to the market's dynamism, at its own speed of processing innovations and changes. The clock speed idea, suggested by Fine (1998), reflects the speed at which business life cycles and those of the plants themselves happen in a certain industrial sector. The computer industry is an industry of fast clock speed, whilst the aviation industry has a slow clock speed. There are three methods considered by Fine (1998) to measure the industry's clock speed:

1. Process: rates of equipment obsolescence and the industry's assets;
2. Product: development and launching cycle of new products;
3. Organizational: frequency of organizational restructures.

The model proposed by Fine (1998) establishes that the structure of the organizations is not stable and varies with time, between vertically integrated arrangements and horizontal arrangements, completing a movement similar to a double helix. External and internal forces, such as competitors specialized in a certain product or service and the excess of red tape of large corporations, direct companies integrated vertically towards disintegration movements and adaptation to horizontal structures. In the opposite direction, when an industry has a horizontal structure, the forces exerted by component suppliers and the incentives of individual companies to promote their own technologies create strong pressures towards reintegration (figure 2).

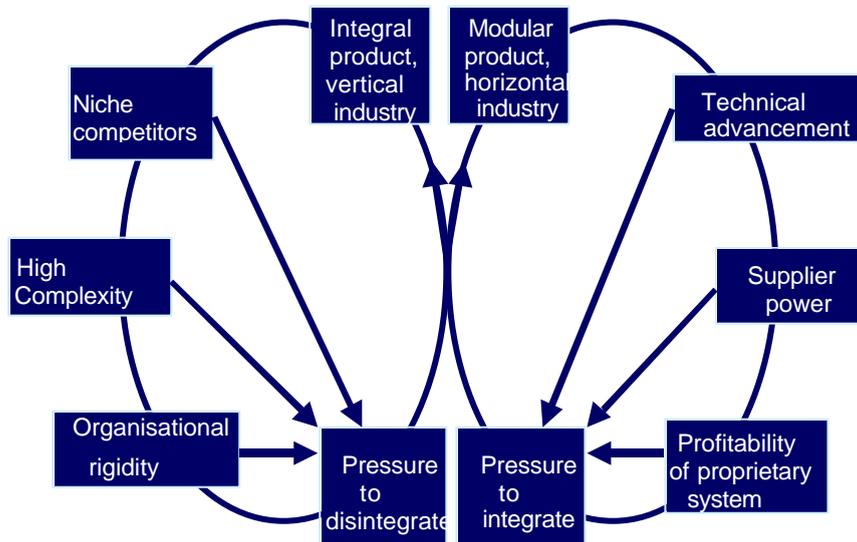


Figure 2 – Double helix (adapted from Fine, 1998)

“The old precept that a chain is as strong as its weakest link is as true in business as in mechanical systems” (Fine, 1998). It is no good for a company to develop competencies and individual skills, if the supply chain in which it is inserted shows potential problems or deficiencies that will risk its operation. The company must have the constant ability of foreseeing the changes and choosing which competencies will have greater value, in order to fully build or develop them.

Fine (1998) calls this concept the supply chain conception and design, i.e., the design of all the organization's supply chain, specially determining in which competencies and skills to invest and which to outsource. The clock speed model suggests, then, a dynamic “theory” where the core competency of an organization is its capacity of continually designing and structuring supply chains, based on the analysis of competencies and skills, with the object of increasing the added value of the company and, consequently, of all the chain.

Fine and Whitney (1996) propose a make versus buy decision matrix, according to which the risks of outsourcing depend on the situation of the company: if the outsourcing is motivated by the lack of knowledge (skills) or by the lack of capacity (resources, mainly financial). It also

depends on the product's architecture, which defines the ease of dividing the product into subsystems or components and, also, on the competition intensity in the activity.

Modular Component/Architecture	Outsourcing: Potential Trap Suppliers can supplant the company, as they have the same or more knowledge	Outsourcing: Best Opportunity The company understands this activity, that does not represent a competitive advantage in itself.
	Outsourcing: Worst Situation The company does not understand what it is buying and how to integrate it.	Able to live with Outsourcing The company knows how to integrate the item, retaining competitive advantage even if others have access to it.
	Dependent by Knowledge	Dependent by Capacity

Figure 3: Dependence relationships with suppliers (adapted from Fine and Whitney, 1996)

At present, the Modular Consortium is in an intermediary position between the two top squares of figure 3. It is a modular product (the engines, tyres, chassis, axles, etc. are not totally exclusive) and VW today is dependent on capacity and technology regarding the modules. However, its technological dependence is restricted to producing the modules, since it dominates the competency to project the truck's configuration as a whole, as well as the "invisible" competency of being the chain's configuring and "conductor" company, the one to create the coalition.

To the extent that VW prepares to increase its share of the client's customized assembled products (today around 15%, but intends to grow rapidly up to 50%), the configuring and conductor-like abilities gain more and more prominence, not because VW would dominate the module technology more, but because this technology isolated would have less and less relative importance in the client's choice. Thus, VW's risk of becoming dispensable and being surpassed by one of the module making companies that started to become vertical or was in a "best opportunity" situation, would decrease.

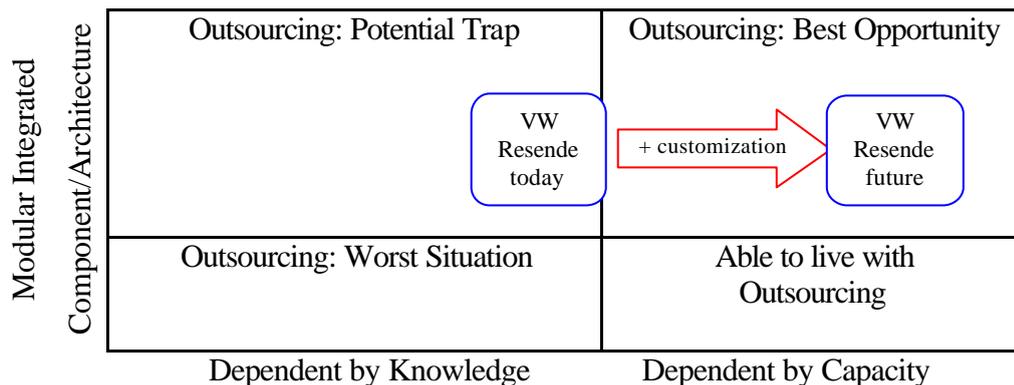


Figure 4: VW Resende position in de Fine and Whitney's model (1996).

The Modular Consortium Model

According to Etlie (1998), modular manufacture is sharing the production and design of the product with suppliers. Numerous experiments are being carried out in the automobile industry, using the logic of modular manufacture.

Some of the main advantages of the modular production models, according to Schonberger (1998), are that conventional car plants must handle an excessive number of components (often over 10,000 per vehicle), and, at the same time, suppliers do not have the skill for "complete products", being responsible for few items. Therefore, the suppliers remain with their positions weakened (not "core" for the supply chain in which they are inserted) and the assembly companies must spend a lot with activities that do not add value, such as material storage and moving, logistics and purchase and production planning. A plant, according to Schonberger (op. cit.), to be efficient, would have to handle a maximum of some hundreds parts, what the modular models allow.

Modular assembly models, according to Kerwin (1998), are an extension of the outsourcing idea. In the automobile industry, Baldwin and Clark (1997) believe that the first step towards modularization was the migration to the cellularized manufacture models, where manufacture cells are responsible for the complete production of modules or sub-assemblies. A second step is the phase where the assembling company outsources the responsibility for the production of this module or sub-assembly; and the third step would be the initiative of the Modular Consortium of Resende, where VW would have outsourced even the assembly of the modules in its own assembly line.

In a continuous change between "make everything internally" and "outsource everything", VW chose, for its Resende plant, to place itself at the "outsource everything" end. Therefore, one of the most appropriate question that someone analysing the model can ask is up to what extent is VW, with this decision, running the risk of becoming a hollow company, with no competencies to distinguish it from the competitors or the they strengthen their importance for the chain in which it is inserted. One of the employees of a module manufacturing company said: *"today we, the module manufacturers, know a lot more about making trucks than VW itself – after all, it is us that are in the plant's day to day solving problems, improving processes and learning..."*.

Will it be that VW did not notice the "potential trap" when it made the decision in favour of the Modular Consortium model, outsourcing all the manufacture and assembly operations? It is difficult to believe that this was the case.

Jarillo (1993) mentions three different risks in outsourcing activities that might result in the full "emptying" of the company that outsources:

- a) company transfers its competitive advantage to the third party that becomes an efficient competitor;
- b) company has its distinctive competitive advantages spread to the competitors by a common third party supplier;
- c) company stops having important innovation and learning sources, transferred to the third party.

Of the three possibilities listed by Jarillo (1993), none could strictly be applied to VW trucks in 1996 (maybe and only partially number three, but it refers more to the creation of future competencies. In fact, when the situation previous to the establishment of the new plant is considered, someone could notice that you really cannot loose what you do not have. Historically, in truck production, first VW based itself on the products and processes of the operation that had been Chrysler's up to the beginning of the 80's. VW remained as pure car assembly company until the formation of Autolatina in 1987, when Ford brought the truck manufacturing technology. When Autolatina finished, VW was already relatively empty of manufacture and assembly competencies of any of the modules that made up its trucks. Therefore, instead of loosing competencies delegating them to third parties, VW really benefited from the suppliers' competencies (at least regarding the design and manufacture of the modules).

The survey carried out showed the decision of VW for the Modular Consortium model (100% of outsourcing) was strongly based on the following factors:

1. Urgency: VW, in 1995, after it had been decided to divide Autolatina, it found itself without a truck and bus plant and without a small engines (1.000 cc) plant, needing to build them urgently. Not having where to look for technology within the group, the fastest alternative was to search for business partners that could bring the building technology of truck components.
2. Lack of design and production competency of every module of a truck.

It cannot be stated, however, that the consortium logic only is applicable when the company does not have relevant core competencies for producing the modules. As it happens, the core competencies might not be in the building and assembling activities of the modules. Resende's situation, after four years of operation, clearly shows that VW today operates in consortium and, even so, has core competencies for the business, such as:

Competencies to design the configuration of the product and the cabin itself;

Competency to warrant a competitive post-sale service;

Competency to manage the well respected VW brand-name;

Competency to orchestrate the working of several module manufacturers;

The possession, maintenance and development of a certain "industrial charisma", capable of forming and maintaining the module manufacturers' coalition;

Competency in managing supplies - VW negotiates many of its truck components in a centralized way, together with its components for light vehicles. With this it can gain bargaining advantages over suppliers, as the production rates of cars are very much greater.

Advantages and disadvantages of the modular consortium model from the research participants' point of view

After four years of operation of the Resende plant, various advantages of the Modular Consortium model can be gathered. The points listed below were taken from interviews during the field survey phase of the research which was the base for this article, with the executives both of VW as of the suppliers, using semi-structured questionnaires. VW manager (of the engineering, production and planning areas) and module managers were interviewed, in a total of 7 interviews:

Module suppliers' commitment with the success of the whole and not with parts of the product, since they get paid when the product is approved and functionally accepted;

Priority with the module supplier's headquarters if there is a delivery or quality problem, since there is an "ambassador" of the module manufacturer inside the assembly plant;

Improved assembly quality as it is carried out by the module supplier, who tends to follow strictly the assembly prescriptions, which does not necessarily happen in conventional plants;

Fast improvement of productivity and quality levels, as the improvements and problem solving cycle is shortened by the presence of the supplier in the assembly plant;

Increased learning by the presence, under the same roof, of several different companies, which bring a rich load of knowledge, allowing for crossed fertilization of ideas and practices;

Shortens the developing and launching time of new products, since the partnership is strong and there are no alternatives of partners, they have been working together for a long time and simultaneous engineering becomes easier;

For some module manufacturers, there is a guarantee of supply, allowing to plan further into the future;

Smaller and decentralized structures of each supplier within the consortium allows for quicker decisions that are taken in only one large structure, as is the case of a traditional assembly plant;

Smaller tendency of parallel personal agendas of managers and executives interfering in the decisions, as the various managers of the different modules are not competing for the same promotions. There is a trend to work less for the partner's failure;

Organizational learning in negotiation. As they are separate companies, there cannot be a position imposition resulting in a loser and a winner. The only way of making a point of view prevail is by convincing and persuading, which does not generate losers;

Possibility of the physical presence of module suppliers without the need of establishing independent industrial units – relevant when it is about production volumes that would have difficulty in breaking-even of independent units.

On the other hand, there are some disadvantages:

Salary negotiation levelled by the assembly plant's standards, with a possible margin loss for the auto-part suppliers;

Matters discussed must be agreed on by 8 partners, which can take longer, as in the case of a labour union negotiation;

Possibilities of problems at start up, reported by everyone interviewed as having been difficult due to the management cultural soup. The learning curve was arduous and could have taken a different direction;

Labour issues that perhaps arise due to the fact that the module manufacturers are executing similar activities to those of VW are an incognita. The direction that the jurisprudence might take is unknown;

Strategic risk that a module can undergo technological developments, but perhaps are not followed by the corresponding partner together with the difficulty of changing the partner. It shows the great care that must be taken when choosing partners in a Modular Consortium model.

Conclusion: after all, is the model adopted by VW Resende a trend in SCM?

The question asked here is: if it is a trend, why did the new VW plants and those of other automobile assembly companies in Brazil (e.g. VW in São José dos Pinhais and São Carlos, GM in Gravataí, Peugeot in Porto Real, Ford in Camaçari) not adopt the Modular Consortium model, only with suppliers assembling modules on the assembly line, even being more recent than the implanting of the modular consortium of VW in Resende?

Although López de Arriortúa, executive considered responsible for the conception of the Modular Consortium at Resende, said (according to a series of interviews published at the time) that he strongly believed that this model should be the supply chain project model of all the VW plants worldwide, none of the plants belonging to the German group inaugurated in Brazil after 1996 were designed according to the consortium model. The 1,000 cc engine plant in São Carlos (SP), although announced by López as one more plant using the Modular Consortium concept, was drastically altered when López left the company, in November, 1996. On the other hand the São José dos Pinhais (PR) plant, which assembles the Golf and Audi A3 cars, adopted the "industrial condominium", having over 20 suppliers of large subassemblies situated around the assembly plant. However, VW, and not the suppliers, is responsible for assembling the modules on the vehicle. Another difference, even more substantial regarding the Resende model, is that the modules considered principal of the vehicle (engine and

transmission included) were not outsourced, continuing to be manufactured by internal operations of VW. Volkswagen bases its competitiveness strongly on the reliability of its products, according to the managers interviewed, and does not risk outsourcing the production of modules so strongly related to this aspect. The actual decision of building a plant for engines goes against López's statement that the policy to "outsource everything" relative to production was a general trend in the automobile industry, concentrating efforts exclusively on activities relative to trademark management, marketing and service.

In other words, the question seems to be in the strategic decision to "make or buy". As VW historically never had had the distinctive competency of manufacturing trucks, in that point of time it chose the "buy everything" strategy. However, this is not the case of manufacturing light vehicles (automobiles) and, therefore, it is difficult to believe that VW would be considering the strategic decision of "buying everything" for all its car assembly plants.

It will be interesting to follow the future projects of plants for its production of extra-heavy trucks, since VW recently purchased, an important stock participation in Scania, a traditional Swedish extra-heavy truck manufacturers, with acknowledged manufacturing competencies of various modules of the products for this market (such as engines and transmission). Our argument is that VW will, very probably, prefer to retain the whole manufacturing process instead of outsourcing these modules, at least in the near and middle future.

Then the answer to the initial question of this section, if the modular consortium model, as implemented in VW plant of Resende (outsourcing 100% of the modules and their assembly on the final product), is a general trend, is simple: no. VW had its historical process reasons to decide in favour of this model (urgency of inaugurating a truck plant because of the end of Autolatina and not dominating core competencies for producing the product's modules). These reasons made the configuration of the pure modular consortium make sense. This does not necessarily mean that in another historical and strategic context this same configuration will make sense. A careful analysis must be carried out in each case, mainly taking into account the core competencies issues to guarantee strategic correct "make or buy" decisions. Once again the notion is reinforced that the contingencies approaches for choosing management models must predominate over the simplistic approaches based on "better practices".

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