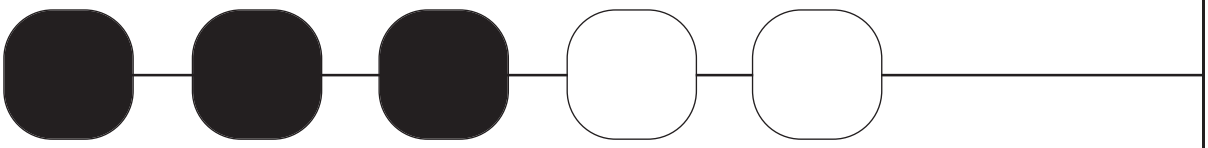


Part 3

Operations Issues

11 General Motors Brazil—Service Parts Business[1]

"Ok, folks, coffee break time!"

The announcement broke the silence in the audience of principals and owners of 30 of the most important Brazilian GM Chevrolet dealerships. They stood up and headed to the next room where a neatly set-up finger food table waited. That was the ten o'clock break of the first day of a series of seminars scheduled to inform and secure the commitment of the dealers to the new AutoGIRO program, a revolutionary new service parts management system, which had been carefully developed by the GM Brazil team during the past two years.

Over the past 75 years, GM Brazil and its dealers established a relationship in which dealers were relatively independent in their management practices. GM was proposing a new system in which GM would start managing the service part inventories of the dealers and replenish items automatically. Denio Nogueira Jr., the AutoGIRO project manager, had decided that before implementing the program, it would be necessary to gain the commitment of the dealers. As one initiative, he hired a university professor to run a series of one-day seminars to go through, including concepts of inventory management and supply chain management, and the details of the AutoGIRO logic, rationale and economic justification from the standpoint of the dealers. So far, everything seemed to be going smoothly. The audience seemed very interested, although the themes dealt with were somewhat technical. The professor was having his first sip when the owner of one of the largest GM dealers in São Paulo approached him and started to chat about the seminar. Denio watched the scene from a certain distance and liked what he saw; this seemed to be a sign of interest of one of the most important opinion leaders in the group. The businessman went on, "Professor, this seminar has been very interesting, you are touching very relevant points, the forecast of the demand, and the management of inventories . . . ."

The professor was happy to hear that, since very few questions and comments had been made during the first part of that morning. "Thank you, and please feel free to address any questions and make any comments for they will be very useful to the whole group." The entrepreneur went on, "And it was a good thing that GM decided to invite someone from the 'external world' to address us . . . ." The professor was increasingly enthusiastic with the chat, thinking, yes, they found it would be appropriate to have someone not directly involved with any of the parties speaking about this new project. The following comment of the dealer-owner showed the professor that maybe things would not be as easy as they expected. The dealer said, "You know, whenever we are invited to a GM-sponsored seminar like this, we are always sure of two things. The first one is that we will have wonderful coffee breaks; the second is that GM will screw us up once again. By the way, since you are not part of GM, could you please tell me in advance when and how they will screw us up this time so that at least I am not taken by surprise?"

1. © Prof. Henrique Correa, Crummer Graduate School of Business, Rollins College, Winter Park, Florida, hcorrea@Rollins.edu; and Denio Nogueira of General Motors Brazil. Used with permission.

The professor started to have a real grasp of the complexities of the long-lasting love-hate relationship between GM Brazil and its dealers and started to understand that changing the management model of that supply chain would take much more than good ideas and good information systems. Indeed the task ahead of Denio Nogueira was both challenging and difficult, and it was only the beginning.

GM Brazil

General Motors Brazil started operations on the January 26, 1925, assembling 25 CKD (Completely Knocked Down) vehicles per day, with complete kits of parts (sufficient to assemble a whole vehicle) imported from the USA, on rented premises. At the end of the 20th century, 75 years later, GM had four large industrial complexes in Brazil producing light commercial vehicles: one in São Caetano do Sul, near São Paulo, one in São José dos Campos, between the cities of São Paulo and Rio de Janeiro, one in Gravataí in the Southern Region and one in Mogi das Cruzes, also near the city of São Paulo.

The Service Parts Business

The service parts business is increasingly important to GM on at least two accounts: first it is a profitable business. Although GM Brazil's overall income is around U.S. $3.2 billion a year, only around U.S. $250 million relates to service parts, and the margins for services are much larger. The automotive market in Brazil is largely dominated by the so called "popular" (very compact) cars, powered with 1,000cc engines (which benefit from tax incentives from the Brazilian government) and represented 61.9% of all cars sold in Brazil in 1999. Normally the "very compact cars" are low priced, aim at relatively price-sensitive low-income buyers, and therefore normally have low contribution margins. A more fierce competition for the Brazilian automotive market started in 1990 when the Brazilian government started to open up the market for both imported cars (reducing substantially the import taxes) and foreign companies who wanted to start up plants in Brazil. Before 1990, only Ford, GM, Fiat and Volkswagen were assembling large volumes of cars in Brazil. By the year 2000, besides the 4 pioneers who had also built new plants in Brazil in the 1990s, Peugeot, Citroën, Renault, Mercedes-Benz, Chrysler, Honda, Toyota, Land Rover, Audi, to mention only a few, had major manufacturing operations already established (or in late stages of completion) in Brazil. More than U.S. $13 billion were invested by all the automotive industry players in Brazil in the 1990s alone.

Second, the service parts business has serious strategic implications for the new car business because it can affect the level of serviceability (measured in time, speed, price and dependability) of the car during its economic life and therefore the very attractiveness of the car from the point of view of the prospective new car buyer.

Both reasons encouraged GM to rethink the way they were doing business with their main partners downstream in the supply chain: the dealers.

The GM Dealership in Brazil

In 2000, there were 472 GM dealers, nine GM authorized garages and ten GM parts distributors in Brazil, or 491 service parts points of sale (p.o.s.). GM had 650 employees allocated to the service parts operation in Brazil, three distribution centers all located in

the Southeastern state of São Paulo, a total of around 75,000 part numbers, with 700 high turnover parts. Twenty vehicle platforms were supported by this operation.

The relationship between GM and the GM dealers had always been independent. Consistent with most supply networks, the nodes of the network were managed separately, favoring the zero-sum game. In other words, in many situations for one business partner to gain in a negotiation, the other partner had to lose. This led to less than cooperative relationships and to independent management systems with undesirable effects. One such undesirable effect was the bullwhip effect, in which small variations in demand downstream caused increasingly large variations towards the upstream portion of the network.

Imagine, for instance, the supply network represented in Figure 1. Even if the demand downstream, given by the rate at which the end customer buys from the dealer, is reasonably stable per item, the demand perceived by GM's (the assembler) distribution center is dependent on the inventory management systems and inventory policies of the dealers. Considering each item, if reorder point policies are used, dealer systems will use EOQ-type (economic order quantity) logic to benefit from scale economies in the logistics costs between themselves and the distribution center. This means that they wait until the reorder points are reached and then issue replenishment orders. Thus, the somewhat stable demand of the end user becomes the lumpy demand of the dealer. This occurs because the distribution center will receive the orders from the dealers only at certain points in time (the points in which the dealer's "reorder point" is reached) and not on a continuous basis, such as what the dealer receives from their customers at the counter. In other words, the distribution center will receive zero orders from the dealer between replenishments and will receive a lump of demand (the dealer's EOQ) when the replenishments are due. The distribution center will therefore perceive a lumpy pattern of demand even when the dealer perceives a somewhat stable pattern of demand.

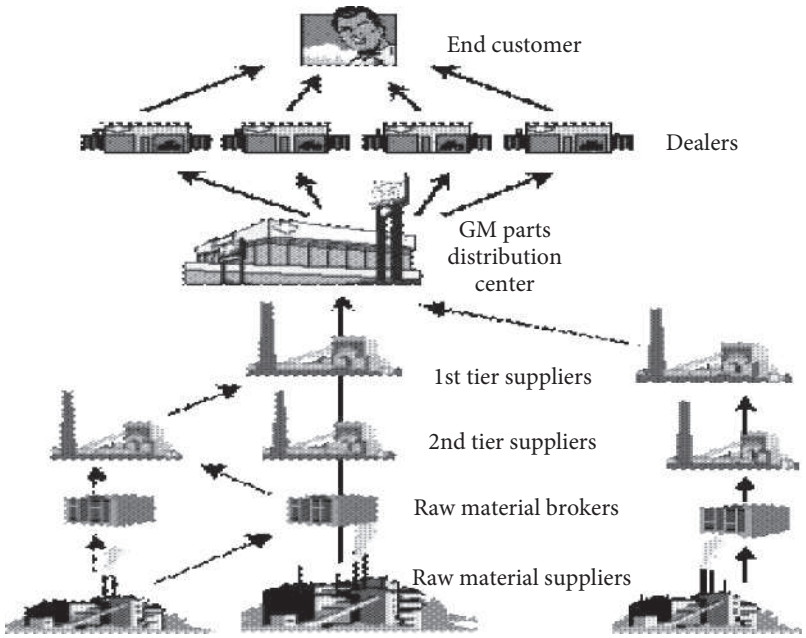
Now consider 483 p.o.s. with their inventory management systems issuing replenishment orders at independently defined moments, of independently defined quantities, and

Table 1 Production and Internal Sales (units) of Light Commercial Vehicles—GM Brazil

Year	Production (cars)	Brazilian Internal sales (cars)	Production (light commercials)	Internal sales (light commercials)
1990	164,198	140,170	35,481	27,443
1991	162,012	143,575	31,064	26,616
1992	173,333	148,293	38,273	27,025
1993	236,900	217,867	35,714	35,438
1994	250,680	234,118	36,152	33,353
1995	290,332	296,460	51,904	50,468
1996	356,711	308,710	86,104	73,780
1997	404,842	331,432	100,258	74,733
1998	336,688	284,195	75,616	56,632
1999	286,242	239,180	47,723	36,616

Source: ANFAVEA, 2000 http://www.anfavea.com.br

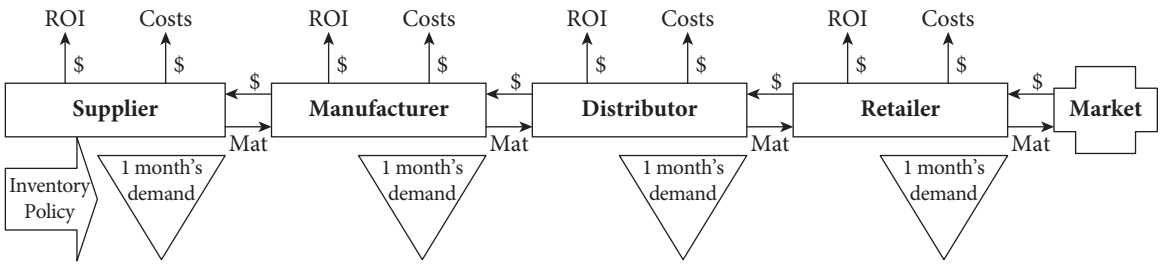
Figure 1 Representation of the GM Service Parts Supply Chain



it becomes clear that the demand the distribution center receives bullwhips in an almost random way. Considering also that the distribution centers have their own inventory management systems with independently defined inventory policies and parameters, and it is clear that the bullwhip effect will be passed on with an amplified intensity to the suppliers, suppliers' suppliers and so on. Because the amplified effect is random, what normally happens is that the firms all increase their safety stock levels.

Slack et al. (2007)[2] shows an illustration of the bullwhip effect in a very simple manner: let us imagine that we have the supply chain shown in Figure 2. Similar to the GM

Figure 2 An Illustration of One Fictitious Supply Chain



2. Slack, N., S. Chambers, and R. Johnston. *Operations Management*, 5th ed. Essex: Prentice-Hall Financial Times (Pearson Education), 2007.

service parts supply chain, there is a flow of material moving from left to right and a flow of money flowing from right to left. Notice that each player takes some of the money they receive from the sales of the materials to pay their costs, pay back the invested capital and passes on the rest, to pay the immediate supplier for the supplied material. The exception is the end customer (represented by the box "Market") who actually does not get any payment for the goods bought; therefore they are the sole "money feeders" of the chain.

Consider for the sake of simplicity that every business has an inventory policy that is to start the month with the equivalent of one month of demand in inventory. Let us also suppose that the market demand for the last months has been 100 units, stable, up until month one. From month two on, there will be a slight change in the market demand that decreases to 95, and remains stable. Follow what happens with the demand perceived by each of the players upstream in Table 2.

Rows in Table 2 represent months; columns represent the nodes in the supply chain. For each of the nodes and each of the months, the variation in inventory levels (beginning inventory and end inventory) resulting from the application of the inventory policies and the produced/purchased quantities are shown.

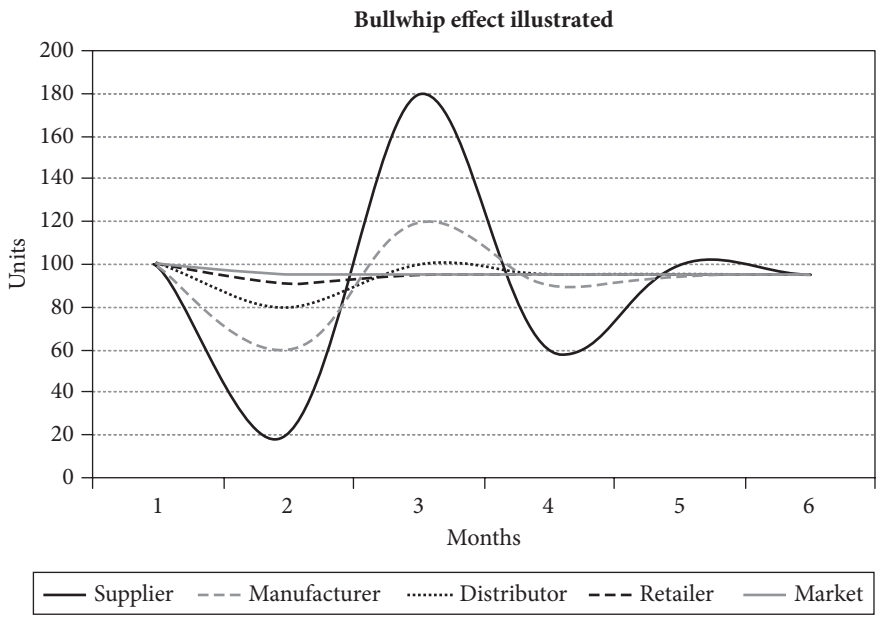
In month one, all businesses keep one month of demand in inventory (100 units) and acquire 100 units. When the market demand falls slightly to 95 in month two, the retailer seeks to adjust its inventory using the inventory policy—to start the month with one month's demand in inventory. So it purchases only 90 units, and this is the demand received by the distributor in month two. Using this same inventory policy, the upstream firms see the amplitude of the variation growing larger and larger. In the next month, the opposite applies and the whip is now upwards. Graphically the effect can be seen in Figure 3.

Although fictitious, the situation described in this illustration reflects what happened in reality with the GM supply chain. The result is severe instability in production programs for the companies upstream, which negatively affect costs in the chain, with plants having to work overtime when the whip goes up and having to face idleness when the whip goes down. This raises costs, which are paid for by the sole money feeders in the chain, the end customers. All these inefficiencies increase (see Figure 2) the final price of the part. Not surprisingly, an original part bought from a dealer's counter can sometimes cost 50% to 100% more than a similar part bought from the so-called grey market (parts

Table 2 **Illustration of the Bullwhip Effect in One Fictitious Supply Chain**

Month	Supplier		Manufacturer		Distributor		Retailer		Market
	Production	Begin inv/ End inv	Production	Begin inv/ End inv	Purchase	Begin inv/ End inv	Purchase	Begin inv/ End inv	Demand
1	100	100/100	100	100/100	100	100/100	100	100/100	100
2	20	100/60	60	100/80	80	100/90	90	100/95	95
3	180	60/120	120	80/100	100	90/95	95	95/95	95
4	60	120/90	90	100/95	95	95/95	95	95/95	95
5	100	90/95	95	95/95	95	95/95	95	95/95	95
6	95	95/95	95	95/95	95	95/95	95	95/95	95

Figure 3 Graphical Illustration of the Bullwhip Effect in One Fictitious Supply Chain



sold direct from the part manufacturer bearing its own brand name and not GM´s). This difference in price is at least partially responsible for the relatively low (estimated by GM to be around 30%) market share of GM original parts (bearing GM´s brand name), as compared to the overall market for GM service parts.

Needless to say, the dealers complained tremendously on at least two accounts: first, they considered GM original parts to not be price-competitive. Second, they complained that to become minimally competitive, they were forced to work with very low margins that jeopardized their returns on investment.

To make the problem even worse, another effect of the zero-sum relationship can be seen in another aspect of the GM–dealers relationship. The GM commercial department sets monthly purchase targets for the dealers based on past purchases. This means that the dealer, based on past history, must purchase a certain dollar volume of parts in order to be entitled to a cash bonus, paid to the dealer's account. The following situation is the norm: by end of the month, GM sales executives start phoning dealers to remind them that they still need to achieve the purchase target. Fearing loss of the bonus, dealers purchase enough to achieve the quota regardless of whether the purchased parts are sellable.

The result of this push-type relationship is that parts are bought, many of which are never sold. In 1999, GM estimated that 30% to 40% of Brazilian GM dealers' parts inventories were obsolete (defined as "not selling for more than 12 months"). This means that a medium-sized dealer, which holds around U.S. $500,000 in service parts inventory, had something between U.S. $150,000 and U.S. $200,000 of their working

capital virtually unusable. This in turn forced GM to increase payment periods, putting a financial strain on the whole supply chain.

Changing the Way GM Does Business in the Service Parts Market

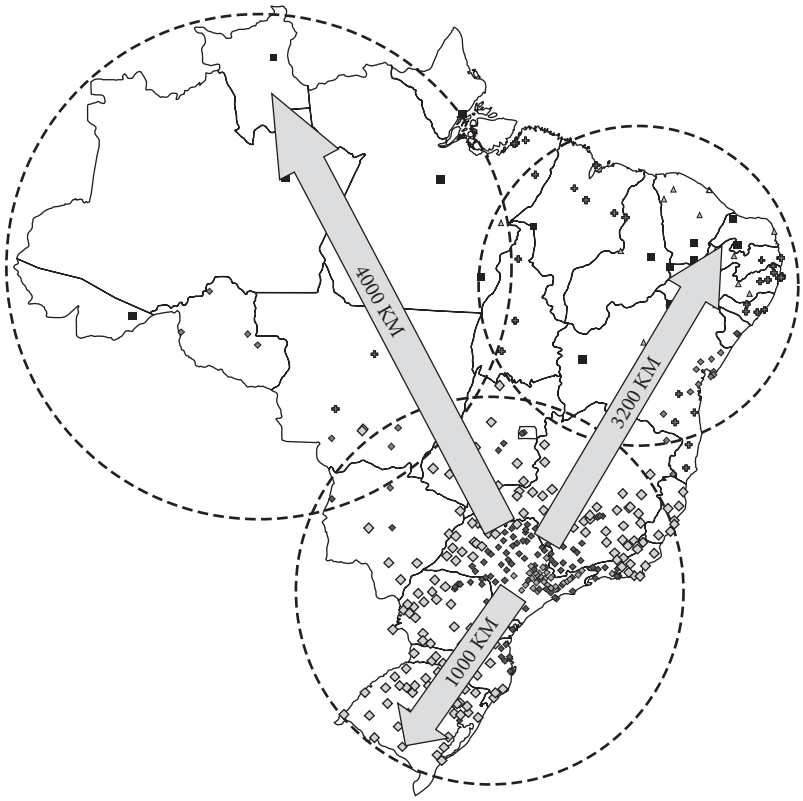
The idea of changing the way GM did business in the service parts market started in 1994 when a GM Brazil director, Steve Koch, got interested in introducing the concept of automatic replenishment in Brazil. Steve took a group of GM dealership owners who were opinion leaders (they were board members of the Brazilian association of GM Chevrolet dealers—ABRAC) on a business tour in the USA, to see companies who were already using the concept. The director already knew the system, and he was convinced that it could work in Brazil, but he wanted to get the commitment of the opinion leaders who would have a very important role in convincing the other dealers. One of the companies visited was Saturn, a then recently launched GM division conceived to be a GM laboratory for innovative management practices. Saturn's relationships with suppliers, unions and dealers were very successful in those early years. They implemented VMI (vendor managed inventory), whereby the dealers' inventories were managed by the vendor (Saturn). They also implemented the concept of automatic replenishment, with frequent deliveries, in some situations, of the exact quantities of the parts sold within three days. They had achieved very a high level of parts availability (94%) and customer satisfaction impressed the visitors.

However, Saturn had been built from a blank sheet of paper. A brand new set of entrepreneurs who had accepted all the rules and regulations to be granted a dealership, free of a legacy of historical love-hate relations, were certainly easier to deal with than a group of almost 500 Brazilian dealers with established practices and perceptions regarding GM. For instance, consider the issue of the inventory management systems. Saturn dealers had all agreed to adopt the Saturn system, things worked almost as if they had Saturn inventory systems terminals at their premises, and they all communicated easily. The communications infrastructure was built from scratch with state of the art equipment and links. A very different situation could be found in Brazil, more than 120 different (usually incompatible) inventory management systems among the dealers, a poor communications infrastructure and a heavy, problematic legacy.

Once the visitors came back with a preliminary approval of the new initiative, GM soon noticed that the poor telecommunication infrastructure would be a problem for the whole project. They decided to launch a satellite project to sort out infrastructure and communications required to support the project. Unfortunately, the satellite project came to a halt some months after it was launched, to cut costs. What had already been done only allowed for the partial exchange of information between dealers and GM, and this was insufficient for the VMI/AR (vendor managed inventory/automatic replenishment) idea.

It was not until March 1997 that GM Brazil started to talk about the project again. A group of GM Brazil executives made international visits to companies who had adopted similar ideas (Nissan Infinity and GM Saturn, among others) and started to generate ideas that were consolidated in a "business case," presented to the GM Brazil Board of Directors in mid-1998. The business case was very clear: any initiative towards VMI/AR would have to be preceded by the sorting out of two basic issues: information technology/telecommunication infrastructure and logistics. Reliability of the intense information flows and intense material flows that would result would be a required condition. Figure 4

Figure 4 491 Points of Sale (Dealers, Distributors and Authorized Garages) Scattered around Brazil



shows 491 p.o.s. in Brazil, scattered around 5 million km^2, requiring reliable deliveries, with most transportation on roads that were not always in good condition.

For the whole project, an overall investment of U.S. $10 million was required. Savings were estimated at U.S. $2 million per year for the supply network from:

- reduced safety stock levels (as a result of better forecast systems)
- reduced bullwhip effect in the plants upstream
- reduced cycle stocks in the dealers and costs in emergency transportation (as a result of more frequent replenishment and better-planned inventory)
- reduced obsolescence costs (only parts with a high probability of sales are replenished)
- reduced lost sales and the possibility of becoming more price competitive

The Board approved the business plan, not only the part regarding IT and telecommunication infrastructure, but also the logistics plan. The IT and telecom initiative was called the GM Connect Project. In order to fund it, GM and the Dealers' Association created a budget—GM would pay 75% of the investment and the dealers would pay 25%. The IT and communications infrastructure were commissioned to EDS (a company

formerly part of the GM group). Emery Worldwide Global Logistics was chosen to provide the transportation requirements.

From 1998 on, a movement started to gain momentum at GM: that of using the successful Saturn experience with aftermarket sales to spread the practices of VMI/AR to other GM divisions around the world. This was part of a GM worldwide strategic move to aggregate more value to the after sale customer experience, aimed to increase customer loyalty to the GM brand.

Following this trend, another GM division that showed interest in implementing a VMI/AR system was the Swedish company SAAB. The GM information technology corporate director, aware of the interest of the two divisions and believing in the benefits of VMI/AR supported the two divisions' initiative and gained the support of the corporate board in Detroit. A joint project was born. GM Brazil and SAAB would join efforts and resources to develop a VMI/AR system. A bid was designed and five companies were invited to present proposals. Three out of the five companies presented proposals to develop the system: IBM, EDS and the French Cap Gemini (through its Swedish branch). Cap Gemini won the contract. The development costs would be shared between GM Brazil and SAAB.

The AutoGIRO System: VMI/AR in GM Brazil's Service Parts Supply Network

The VMI/AR system to be implemented was named AutoGIRO. The logic behind it was quite simple and can be explained by some of its principles:

1. *It is a VMI system: GM assumes the responsibility for managing dealer inventories.* VMI makes sense in this situation because GM, being the common denominator of the network, is the only player in the network that can actually see the aggregated demand of the almost 500 dealers. With this information, GM can identify national patterns of demand and therefore enrich the demand forecast of each dealer with these national patterns. Since the demand forecast is a great part of the task of managing inventories, GM assumes the responsibility for managing the inventories too.

   VMI also makes sense in this situation because GM delivers thousands of different items (each dealer has around 6,000 active inventory items, of which around 2,500 are normally purchased within any month) to a defined and stable group of dealers. This means that economies of scale in logistics can be achieved if deliveries to several dealers share the transportation costs using a "milk-run" type of routing in which one mode of transportation makes periodic and coordinated deliveries to a group of dealers. GM is the only firm that can coordinate these deliveries (even if it actually happens via the use of a logistics service provider, Emery).

   This means that GM suggests when, how many, and what the dealers should buy. However, given the past relationship in which GM tried to maximize sales by pushing parts downstream in the chain, it would be plausible that the dealers would resist the idea of GM managing their inventories. To overcome this resistance, GM granted:

2. *Protection against part obsolescence and stock outs.*
   Dealers feared that GM would force parts on them to maximize sales and that these parts would become obsolete. To avoid this, AutoGIRO guaranteed dealers who accepted suggestions for parts replenishments that any part that went more

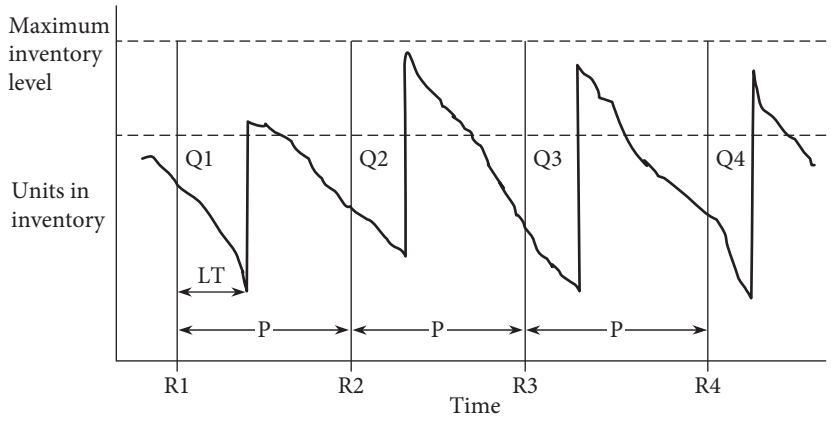
than 9 months without a sale would be repurchased by GM for the maximum of either the current price or the price the dealer paid for the part. This meant that if GM overestimated the purchases, it assumed the costs of the mistake. Similarly, if the dealer accepted the GM suggestion for the replenishment and ran out of a part, GM would ship the part using urgent delivery, with no extra cost for the dealer. Before the AutoGIRO program, obsolete parts were the dealers' problem and urgent deliveries would be charged higher fees.

3. *Provision of an Internet-based "parts locator."*
   In order for GM to be able to manage the dealers' inventories and provide automatic replenishment, they needed to have very frequently updated information on the stock position of each stock item of each dealer. GM would make this information available to the dealers. This meant that in the case of a stock out, a dealer with an urgency to serve a customer could browse on their extranet and search for that part availability at a dealership nearby, potentially getting the part the same day (depending on the dealer's location).
4. *Replenishment done 2, 3, or 5 times per week depending on the dealer's demand volume.*
   Present reorder point systems used by the dealers tended to treat items independently. Therefore the logic used was to "dilute" logistics costs by transporting a large number of units of each item—and this tended to increase cycle inventories (the average level of inventory that builds up as a function of the replenishment cycle—the less frequent the replenishment, the higher the cycle inventory).

   One of the most utilized systems actually limited the replenishments to a maximum of three times per month per part. This meant that in the most favorable case, the replenishment quantity would be equivalent to 1/3 of the monthly demand. The average cycle inventory would therefore be 1/6 of the monthly demand. In the case of AutoGIRO, in which a part is possibly delivered daily, the replenishment quantity would be about 1/20 of the monthly demand and the average cycle inventory would be 1/40 of the monthly demand. Quite a reduction, made possible because AutoGIRO considers that the transportation cost does not have to be "diluted" by a large number of units of one item, but by a small number of units of a large number of different items.

   The system recognizes that different items will go from the same origin to the same destination, in a joint replenishment. This means that logistics costs do not skyrocket even with small replenishment lots per item. In addition to the joint replenishment economies of scale per dealer, for each region the dealers that receive replenishments on Mondays, Wednesdays and Fridays would be served by a common means of transportation, in a milk-run routing logic. This consolidation of loads helps in keeping logistics costs down.
5. *Periodic review of inventory management system.*
   To achieve economies of scale in logistics, it is necessary to replenish all items needed at regular intervals. This means that for this type of VMI, the system that is more applicable is the so-called periodic inventory review system. This system makes sure that all dealer parts are checked periodically (AutoGIRO does it daily). Depending on the stock position of the item when checked, a certain quantity is replenished. This quantity is calculated as the difference between a maximum pre-established level and the stock position as indicated in Figure 5, at each review period (Rn). A replenishment order is issued, and after the transportation lead time (LT), the replenishment quantity (Qn) arrives. Note that in this system, the reviews are done at fixed intervals, but the quantities replenished vary depending on the stock levels.

Figure 5 Periodic Review Inventory Management System Used in the AutoGIRO System

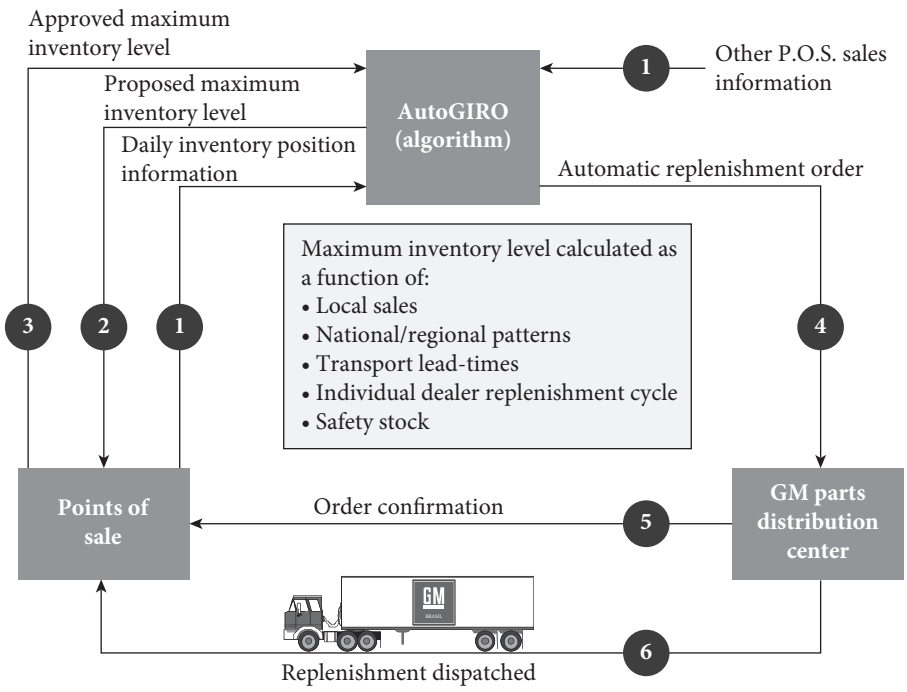


The AutoGIRO information and material flows are shown in Figure 6 and described below.

Flow 1. The points of sale have to send GM a file (via electronic data interchange) between 6 p.m. and 10 a.m. daily that contains information on: unit sales of the day per item (including lost sales because of possible stock outs, to make sure that forecasts are accurate), inventory position at the end of the day, pending receipts of material (in transit) and allocations (parts that are in inventory but that are already reserved for, say, a next day repair of a car in the garage). The inputted information will feed the time series, based on the short term demand forecast per item per p.o.s. GM also receives sales information of all other p.o.s. and uses this aggregated demand to enrich the individual SKU (stock keeping unit: associated with one particular item inventoried in one particular point of sale) and the demand forecast with possible national or regional patterns. The high quality of the information generated and sent off by the dealers is an assumption of the system and is also the responsibility of the information generators. The information generators (the sales clerks at the dealers' counters) unfortunately, may not have the quality of information needed. Denio Nogueira is particularly worried about this. He knows this can be a trap and bad quality data can quickly ruin the system's credibility.

Flows 2 and 3. Once a week, normally on Monday morning, AutoGIRO re-calculates the demand forecast (for the next week) and based on the new demand forecast, re-calculates the new maximum level of inventory for each SKU (as shown in Figure 5). The list of new maximum levels of inventory for all parts for each p.o.s. is made available in the extranet. The parts managers at each p.o.s. then analyze the new proposed maximum inventory levels on Monday morning and have the chance to either approve it or to alter it according to their qualitative analysis of the next week's demand. For example, a change in demand due to a promotion might impact the analysis. This demand change obviously could not be captured by the quantitative methods (a modified form of moving average) used by AutoGIRO. Once the parts manager informs AutoGIRO of the approved and/or modified maximum levels for the items, those are the maximum inventory levels that will be used by AutoGIRO to calculate the automatic replenishments daily.

Figure 6 AutoGIRO Information Flows



Flows 1 and 4. During the week, AutoGIRO receives the inventory position daily and calculates the difference between the currently agreed maximum level of inventory and stock position and automatically sends information to the GM distribution center.

Flow 5. The GM distribution center sends an advance notice to the p.o.s. announcing that a delivery is on its way and relays the quantities to be sent.

Flow 6. Logistics are sorted out (picking, packing, identifying) and deliveries are made using the appropriate milk runs, according to the frequencies (2, 3, or 5 times per week) defined by the demand volume of the p.o.s.

Since the "maximum levels of inventory" are actually low and the replenishment is done frequently, p.o.s.'s are sent information daily including the amount of items sold the day before, which characterizes a daily automatic replenishment system.

The Expected Advantages of the AutoGIRO Program

General Motors Brazil expected the following from the AutoGIRO system:

- Because it improves demand forecast accuracy through better projection models, careful treatment of the time series sales, and the recognition of aggregated

patterns of demand, GM expected a drastic reduction in the levels of safety stocks needed at the p.o.s. and simultaneously expected an increase in their parts availability at their sales counters.

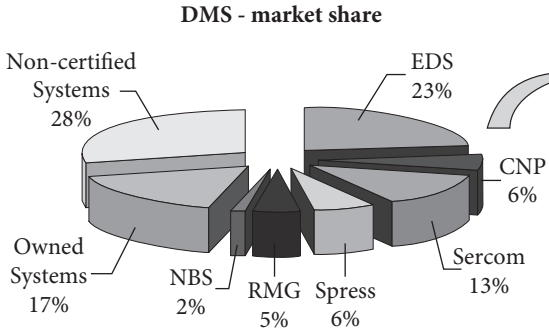
- Another aspect of AutoGIRO expected to help increase the availability of parts was the "parts locator." At Saturn, the parts locator was responsible for a whole extra percentage point in their parts availability. They had 94% immediate availability at the counter and 95% same day availability (parts located by the *parts locator*).
- Because of the much higher frequency of replenishment, cycle stocks were also expected to fall drastically at the p.o.s. (see Appendix 1). A simulation study was performed to compare the performance of two systems: one of the current ones used by dealers and the AutoGIRO. (Appendix 1 shows the results related to radiator fluid, a high turnover part). The graph gives a good idea of the difference in inventory level profiles at the dealer during the simulated period.
- AutoGIRO coordinates supply and demand at the point of sale, reducing the bullwhip effect upstream in the network. Therefore, safety stocks in the inventory points upstream in the network were expected to fall and plants upstream in the network were expected to have stable production programs and increased cost effectiveness.
- Because there would be a team at GM of well-trained analysts dedicated to continuously improving AutoGIRO, every improvement in the algorithms, in the practices, in data treatment, etc. would benefit the whole set of points of sale. There would be no need for each of the partners to keep managers updating and improving the system at their own cost. Improvement costs would be shared among the whole network.
- A reduction in the high costs of sending express deliveries when stock outs occurred was also expected. With better management of the inventories at the p.o.s., it was expected that these costs would be substantially reduced.
- Before AutoGIRO, research conducted by GM showed that around 80% of the working time of a dealer parts manager was spent managing the inventory and making decisions about replenishment. With AutoGIRO automating a great part of this, GM expected that the parts managers would spend their time doing something more valuable, which could only be done by in-person: developing customer relationships, searching for new market opportunities, and actually selling parts. The intention of GM was to actually turn the parts managers from "wholesale buyers" into "retail salespersons and marketers." GM was already providing these professionals with training in marketing and sales so they could better face this new challenge in their careers. This way GM expected to substantially increase their market share in the GM service parts overall market.
- Another result expected from AutoGIRO was that in the future when the newly acquired network efficiencies settled, part of the benefits could be passed on to the final customer in the form of price reductions, to help improve the competitiveness of GM original parts in the marketplace.

Potential Pitfalls for the AutoGIRO Project

The following were seen as potential disadvantages of AutoGIRO:

- Although technically the AutoGIRO project was very similar to the Saturn model[3], the two projects were actually quite different and Denio Nogueira and his team were fully aware of it. Saturn started from a blank sheet of paper and GM Brazil had a 75 year old network. According to Denio, "this makes the whole difference."
- There was not a cooperative culture in the supply chain network and for AutoGIRO to work, cooperation was paramount. The GM team also knew that actions should be taken to make sure the cultural changes happened.
- GM also knew that a strong commitment of the dealerships' top managers and owners was of paramount importance for the success of the program. Would the seminars run by the invited professors be enough?
- There were more than 120 different inventory management systems in the network, each one generating data in a different and normally non-compatible format. Figure 7 illustrates the frequency with which different systems can be found among the dealers.
- Owned systems are systems which were developed internally by the IT departments of the dealers. Because of the historical independence of the partners, GM could not impose or force the dealers to adopt a specific inventory management system.

Figure 7 Dealers Management Systems Market Share



	Qty	%	% Accum
EDS	105	23%	23%
CNP	27	6%	29%
Sercom	58	13%	42%
Spress	28	6%	48%
RMG	21	5%	52%
NBS	7	2%	54%
Owned	78	17%	71%
Not-certified	132	28%	100%
TOTAL	**456**		

3. See "Saturn's Supply-Chain Innovation: High Value in After-Sales Service," by Cohen, Lee and Willen, published in volume 41, number 4, Summer 2000 of the *Sloan Management Review* for a description of the Saturn service part management system.

- There were some dealers which lacked cash to invest in the necessary IT and telecommunication infrastructure (e.g., antennas, large Windows NT servers), many times because they were short of cash due to obsolete inventories in their warehouses. This was also something which was very different from the Saturn situation.
- The data quality issue also concerned the GM AutoGIRO team. Preliminary research conducted with a sample of dealers showed that the levels of inventory data accuracy were very low indeed. Most dealers still used the practice of yearly inventory counts for the purpose of generating tax-related reports. As Denio remarked: "if the levels of inventory data accuracy are so low, what will happen with the accuracy of the new data which we are requesting e.g. lost sales? Will we be able to trust this data?"
- Another assumption of systems such as AutoGIRO is a high level of consistency in delivery lead times. This might pose a problem for the logistics provider.

The Future

Plans to actually implement AutoGIRO were ambitious in August 2000. By the end of the year 2000, GM Brazil had the system fully operational at 48 dealers, and the goal for the year 2001 was to have it implemented in 200 more dealers. "Quite an ambitious goal," agreed Denio Nogueira, while still thinking about the sarcastic comment of the dealer owner during the first seminar …

Discussion Questions

1. Why did GM Brazil decide to change the way they were doing business in the spare parts market?
2. What are the advantages and disadvantages of AutoGIRO to the companies involved?
3. What are the things that must happen for AutoGIRO to succeed, and how can GM help these things to happen?
4. How should GM go about convincing dealers to adopt the new inventory system?
5. Should GM help to improve the tight cash situations at some of the dealers? Why or why not?
6. With AutoGIRO automating a great part of a parts manager's work, what do you think their new role should be at the dealers?

Appendix 1. Results of Simulation Comparing AutoGIRO and One of the Current Systems Used by Dealers

The chart shows the resulting daily levels of inventory at the dealer for one part when using two different inventory management systems: AutoGIRO and the former system (called Maxi Peças). For the same past demand and same six month period, the ProModel simulation software was used to describe how both systems would have worked. One can notice the effect that larger replenishment lot sizes of the former system have on the inventory levels.