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Sitting Pretty: Managing Customer-Driven Innovation at Faurecia Car Seating

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Abstract. This case study focuses on the car seating division of Faurecia, the third largest automotive supplier worldwide as it faced challenges linked to drastic changes in its business model, resulting from strategic moves by carmakers. The central issues in the case study concern the changes Faurecia should implement to its manufacturing strategy and its new product development process in order to increase its performance and sustain the competitive pressure in a mature market. Not as well-known as some of its competitors, like Johnson Controls Inc and Lear Corporation, Faurecia was nevertheless a world-class player in the automotive components industry, active in four main areas: automotive seating, vehicle interiors, exhaust systems and front-end module. With some 60.000 employees, 160 industrial sites and presence in four continents, Faurecia, was among the top twenty largest global suppliers to the automotive industry. The case study can lead to discussion about new product development in a price sensitive market, the design for manufacturing (DFM) concept and the "co-opetitive" (competitive + cooperative) relationships among the different players in a complex supply chain. A teaching note is available from ECCH (www.ecch.com).

Keywords: manufacturing strategy, product development, Design For Assembly (DFA), Design For Manufacturing (DFM), ergonomics, car industry, logistics, supplier involvement, Just-In-Time (JIT), lean manufacturing, customer-driven innovation.

1. Introduction

It was a late afternoon in November 2003, and the twilight flooding the countryside around Narita airport gave an impression of harmony and peace. But peaceful, the minds of Faurecia managers were not. Aboard the Japan Airlines 747, a team led by Mr. Gaston Jacques, R&D director of the automotive seating business unit, was returning home from a study trip to visit customers and competitors. Despite the excellent weather, the team's mood was gloomy; as Mr. Louis Pourdieu – Vice President Manufacturing, Automotive Seating – later on summed up:

> We realized that we had a double digit productivity gap relative to our competition, that our development cost was much higher, that we had bigger

1. This case study was written by Francis Bidault and Alessio Castello of the European School of Management and Technology. It is not intended to represent either effective or ineffective handling of a management situation.

ergonomic issues in our just-in-time plants and that we needed to still improve our quality standards.

Being less efficient than the competition in the car industry was simply not allowed as automotive suppliers faced a formidable and growing array of selection criteria imposed by their customers. These criteria incorporated cost competitiveness, quality, technology, logistics capabilities, and others associated with being a full-service supplier such as R&D, product development and engineering resources. Frequently, all of these demands had to be met in a context of annual unit price that declined through a model programme life cycle. For suppliers, survival, let alone growth and modest prosperity, was difficult in such an environment and they had to adopt the best possible strategies to compete in the global market.

Faurecia's top management decided that it was time for reviewing the company's approach to the car seating market and that innovative solutions would be required to keep the company among the three largest players worldwide.

2. Faurecia: A World Leader in Car Seating

Faurecia was incorporated in 1998 following the merger of Bertrand Faure and Ecia (a subsidiary of Peugeot-Citroen) that led to the creation of a world-class player in the automotive components sector. Faurecia was active in four main activities: automotive seating, vehicle interior, exhaust systems and front-end module.

Since its incorporation, Faurecia's revenues had been steadily growing to 10.7 billion euros in 2004 (refer to Exhibit 1). The company had reached a multinational status with 60,000 employees in 28 countries, 160 industrial sites and invested 600 million euros in R&D every year.

By 2005 Faurecia was the ninth largest parts supplier to the car industry worldwide and the third largest player in car seating. Over the years, it had become clear that a truly global supplier to the automotive industry needed not only to be technologically advanced, but also that manufacturing excellence and cost competitiveness were required to fully satisfy the car industry needs.

Automotive seating was Faurecia's largest division with sales of nearly 4.8 billion euros in 2004. It was one of the most integrated seat suppliers in the world, hence able to cover the widest range of orders from car makers. In addition it was the world leading supplier of seat mechanisms and intended to stay that way. Historically, the main focus of the company for car seating was on metallic structures and mechanisms, as this corresponded to customers' demand: originally the seat assembly was done by carmakers. However, with the trend towards increasing outsourcing, the car seating division had gradually expanded its offering.

Exhibit 1: Faurecia's sales by business segment

Sales by business segment

(in € millions)	2004	%	2003	%	2002	%
Vehicle Interior Modules						
- Automotive Seating	4784.7	58	4353.2	55	4031.6	54
- Vehicle Interiors	3500.9	42	3505.7	45	3462.8	46
	8285.6		7858.9		7494.4	
Other modules						
- Exhaust Systems	1714.9	70	1587.9	70	1777.7	75
- Front-end	719.0	30	675.9	30	593.4	25
	2433.9		2263.8		2371.1	
Total	**10719.5**		**10122.7**		**9865.5**	

Source: Faurecia

At the turn of the century, one of Faurecia's key strengths was its expertise in all aspects of car seating. It had in-house capabilities to design and manufacture components for its own assembly lines as well as those of its customers. Faurecia was especially strong in adjustment mechanisms, frames, recliners and tracks. Since recently, it also made foam pads and trim covers (refer to Exhibit 2). Faurecia had expertise coordinating and managing for just-in-time (JIT)[2] delivery of complete seats and operated JIT facilities around the world.

Exhibit 2: Structure of front seat

Source: Faurecia

2. Manufacturing functions organized in such a way to enable the shipment of goods exactly where and when needed thus permitting a drastic decrease of inventories

The company's vertical integration was certainly among its key strengths; yet, in an evolving market requiring innovative business models, product development and offering had to be fine tuned to satisfy the customers' needs.

In the car seating industry there was both intense competition and extensive cooperation. Faurecia, like the other suppliers, delivered frames both to its and the competitors' assembly plants and assembled seats to car manufacturers using its own as well as its competitors' metallic structures.

3. The Car Seat Industry

All companies supplying parts to the car industry were entirely dependent on the automotive market. To understand the components market it was therefore crucial to analyze the car industry.

3.1. The Car Market

Since the early 80s, the car industry had turned into a mature one. Yet, competition never seemed to cease and new players continued to enter the market to challenge the existing leaders. Competition had become global as new entrants either started production or exported their models into the large European and North American markets. Market shares were always moving, generally down for the Western car makers, and up for the Asian ones.

The challenge of global competition had forced the Western competitors to review their strategies and operations to try to match the "best in class" (the leading Japanese makers in particular). This resulted in drastic revisions of the manufacturing processes, with "lean operations" (minimum inventories), greater reliance on suppliers (outsourcing) and a special emphasis on quality (Total Quality Management). As car makers (known also as OEMs – Original Equipment Manufacturers) changed the scope of their operations, suppliers had to redefine their business. Many suppliers took responsibility for activities that OEMs gradually gave up, but competition was fierce and car makers also put pressure to reduce the number of their supplier base.

In 2004, after a few years of moderate growth, the global automotive market had grown 5.2% year-on-year to reach 60.9 million units, despite the convergence of many adverse external factors hitting the industry. Asia and Eastern Europe contributed the most to the sales increase observed in 2004. In the three largest regional markets, Western Europe was the main growth catalyst, with car sales rising 3% to almost 16.5 million units whereas the US market grew by a timid 1.4% to 16.8 million units and the Japanese market was flat.

The world's top 12 OEMs controlled 83.1% of global market (refer to Exhibit 3). With some 8.633 million vehicles sold worldwide, GM's global sales grew

3.3% over 2003, giving the US carmaker a 14.9% global market share. At the same time, Toyota's global sales increased 10.3% while Ford only managed to push sales up 1.7% in 2004. Toyota had zoomed ahead of Ford, securing a 900,000 units lead over the world's second-largest carmaker whilst reducing its lag behind GM to 1.160 million units. Other Asian brands also performed above industry average in 2004, and Hyundai reported the strongest sales growth among the top 12 carmakers, with car sales soaring 11.6% over 2003 to 3.147 million units. In 2004, Toyota not only had the industry's largest market capitalization but also generated the highest net profit and had the second best operating margin.

Exhibit 3: Top 12 car manufacturing groups by sales

Top 12 Manufacturing Groups By Sales									
	2004			2003			2002		
	Sales	Market Share	y/y Change	Sales	Market Share	y/y Change	Sales	Market Share	y/y Change
General Motors	8,633,626	14.9%	3.3%	8,354,406	14.4%	-1.2%	8,456,682	14.9%	-1.6%
Toyota	7,470,442	12.9%	10.3%	6,770,427	11.7%	9.1%	6,206,621	11%	4.5%
Ford	6,570,131	11.3%	1.7%	6,460,421	11.1%	-0.5%	6,496,060	11.5%	-4.8
VW Group	5,006,651	8.6%	2.4%	4,887,743	8.4%	0.5%	4,861,839	8.6%	-2.5
DaimlerChrysler	4,159,385	7.2%	2.6%	4,053,126	7%	-3.4%	4,194,326	7.4%	-2
Nissan	3,202,349	5.5%	9.2%	2,933,831	5.1%	8.6%	2,700,425	4.8%	5.7
Honda	3,189,001	5.5%	9.3%	2,917,516	5%	2.6%	2,844,756	5%	6.5
Hyundai	3,147,812	5.4%	11.6%	2,821,302	4.9%	2.6%	2,750,682	4.9%	9.3
PSA Group	3,118,380	5.4%	0.1%	3,115,868	5.4%	2.3%	3,045,577	5.4%	4.7
Renault Group	2,397,246	4.1%	4%	2,305,842	4%	-0.4%	2,316,024	4.1%	-0.2
Fiat	1,992,356	3.4%	4.4%	1,908,933	3.3%	-8.3%	2,081,977	3.7%	-12.5
Suzuki	1,785,422	3.1%	10.1%	1,621,837	2.8%	8.9%	1,489,527	2.6%	4.6

Source: Global Insight

Already afflicted by overcapacity, the automotive industry and its main players were expected to face further challenges, some set to linger on for some times such as fluctuating currency markets and uneven economic growth, others being more immediate, like the sudden rise in raw material costs seen in the second half of 2004. Global carmakers were pressured to respond appropriately to these external factors while securing growth in new booming markets and continuing to invest in new technologies and meeting more stringent regulations to ensure that they maintained an upper hand on new players. As of 2005, and although it was still described as a mature industry, car manufacturing was attracting a new set of new entrants, the majority being located in China.

Western car makers, therefore, also faced real pressures to seek out growth prospects outside traditional mature geographic and product markets. At the geographic level, the pressure was on to seek out areas of growing demand, with China clearly at the top of the list for most, and other countries in Asia not far behind. At the product level there was a constant search for the next niche (such as the SUVs – Sports Utility Vehicles, in the 90s) that would generate significant competitive benefits, at least for the period before competitors would follow suite and degrade margins.

3.2. The Suppliers to the Car Industry[3]

For suppliers to the automotive industry, the drivers of globalization and the redefinition of the value chain were fairly straightforward. The opportunities were huge, as OEMs left entire businesses to be taken over. But, strategic risks were also considerable as several suppliers realized later on.

High-profile corporate failures in North America, most notably Meridian Automotive Systems, Tower Automotive, Delphi, Dana Corporation and Collins & Aikman, all of which had filed for Chapter 11 protection (to avoid bankruptcy), highlighted how things could go wrong. Although exacerbated by recent cyclical downturns at major customers, the demise of all five reflected the costs of facing the challenges outlined above.

Global trends were hard for suppliers to ignore, especially those at the so-called "tier one" level, e.g. those supplying directly to car manufacturers, and coordinating a set of sub-suppliers (nick-named "tier two"). Through the growth of overseas purchasing offices, virtually all carmakers had access to a wealth of information on global procurement and pricing. With this knowledge, they could pressure suppliers to meet these prices, or move offshore.

Besides, with the need to discount all but the most popular models and the resulting profit squeezes at carmakers, suppliers had to accept an era of annual price declines for their components, systems, and modules. Given the increasing costs associated with greater product development and logistics responsibilities, suppliers faced the continuous threat of declining profitability and margins. The possibility of a new wave of consolidation among OEMs was, of course, not a scenario that suppliers appreciated.

Suppliers were left with the option to join in innovative programs which car makers launched in an effort to outrun their competition. These were typically aiming at niche products (such as new hard top convertibles), which, if successful, would allow the car maker to charge decent margins and, in turn, accept to reward nicely its suppliers for their support. However, getting in this type of programs required substantial engineering efforts to support the OEMs' innovations. This

3. Adapted from "Challenges and forward strategies for the global automotive supplier sector", 2005 – Just-auto.com

is what Faurecia succeeded to achieve with the Toyota Verso program for which they designed a very innovative back seating system which could fold with the pressure of a single finger!

3.3. The Car Seating Industry

The relationships between OEMs and their seat suppliers had undergone substantial changes since the mid-80s, with the outsourcing of a growing portion of the seating modules to suppliers.

In the late 80's, after a period during which OEMs designed and made seats entirely in house, carmakers started outsourcing the manufacturing of the metallic parts of seats, e.g. frames, tracks and mechanisms. Therefore a number of suppliers from the steel industry, among which Bertrand Faure, who previously supplied metal pieces for OEMs to assemble seats, started to ship seat frames (the "skeleton" of the seat) to OEMs who covered them with foams and textile. The model adopted was the so-called "build to print", through which OEM designed the pieces required and suppliers received detailed plans and volumes of parts to be manufactured.

Back then, seat suppliers worked on customers' specifications and their role was to deliver on time a limited variety of products with some possibility of inventory at client site. Their main activity was the processing of metallic parts and the equipments used were metal working tools.

In the late 90s, carmakers, first in the US and then throughout the world, began to outsource the whole seat manufacturing and assembly (sometimes even design) to tier-1 suppliers. This move implied a change of position in the value chain for metal parts manufacturers like Bertrand Faure who moved from tier-1 to tier-2 (thus loosing contact with OEMs).

Also, the delivery procedure of complete seats was radically different from the one used until then for seat frames and metal parts: carmakers expected to reduce inventory and cost of supplies by streamlining shipments. The concept of Just-In-Time delivery was adopted, meaning that OEMs expected their suppliers to assemble the seat minutes before it was to be mounted on the car in their assembly line.

OEMs realized that this approach towards supplying seats had multiple advantages: it moved the development cost to the supplier, it reduced the engineering skills required in-house and it cut the investment required to launch a new model (production tooling and development cost were paid as a fraction of each part supplied and not when incurred); essentially, outsourcing the seat manufacturing reduced the OEM's risks. Following this trend, the French Peugeot-Citroen group spun off its car seating division that merged with Bertrand Faure to create Faurecia.

The new company decided that its place ought to be in the "tier-1", hence supplying complete seats. This meant that it not only had to acquire new skills (among which assembly techniques and dealing with a large number of suppliers), but also to adapt to new ways of interfacing with customers for shipping parts.

The cost structure of frame suppliers who decided to become seat manufacturers changed dramatically as the cost of assembly appeared into the equation and had to be optimized.

Since the early 2000s, in an industry facing strong economic challenges, a further new trend began to appear: OEMs started to impose to tier-1 suppliers to source components from tier-2 suppliers selected and qualified by them. Also, with the intent of increasing pressure on suppliers, carmakers divided the seat and its frame into small subsystems, and, according to this scheme, OEMs could order the cushion frame, the backrest frames and the reclining mechanisms from three different suppliers; plastic covers, foams and other parts from other suppliers and then have contracted still a different company to do the assembly and coordinate the whole process. This scheme was called the "unbundling" of the seat.

As a consequence, roles in the supply chain were changing fairly radically and the control on the value chain and consequently on profit margins started shifting. The challenge for suppliers was to keep growing as they concentrated on these new roles. Supplier were redefining their positioning, ranging from attempting to do everything to narrow specialization. In short, suppliers needed to adopt different roles, competencies and strategies, and this could result in new business models.

With the unbundling of the seat, Faurecia, having the competencies and capability to address virtually all blocks of the seat supply chain, had to adapt to an increased variety of customers' demands. Its activities varied from designing and making entire seats to supplying some parts to a competitor's JIT through assembling seats using competitors' parts.

3.4. The Car Seats Market in 2005

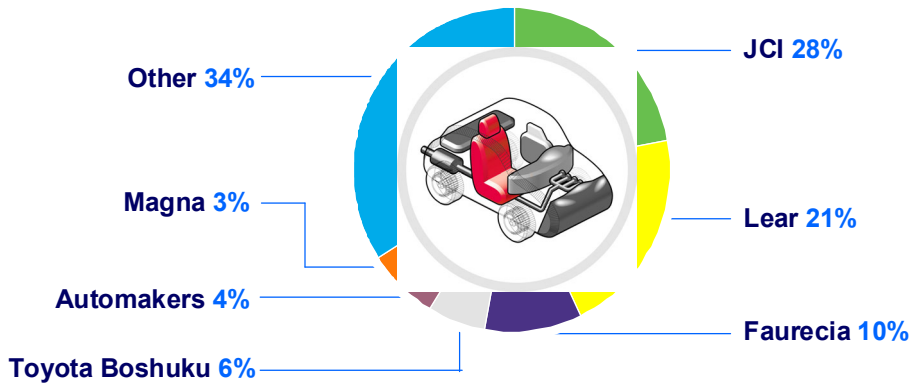
The world market for car seats reached 27.5 billion euros in 2005. There were about 30 suppliers, a large majority of which had a limited geographical scope or addressed specific niche segments (refer to Exhibit 4).

The industry was dominated by three main players: Johnson Controls Inc with about 28% market share, Lear Corporation with around 21% and Faurecia with about 10% market share. Each of these three companies had operations in at least four continents, and altogether they represented about 60% of the global market.

In-house manufacturing (e.g. seats made by car manufacturers directly) represented a small 4% of the market. In other words, 96% of the seats manufactured were outsourced: the seat's increased complexity coupled with strong pressure for cost containment favored large manufacturing companies who

could benefit from economies of scale, in particular for R&D spending, quality improvement programs and manufacturing excellence.

Exhibit 4: 2005 worldwide car seats market share



Europe		
1.	Faurecia	30%
2.	JCI	29%
3.	Lear	25%
4.	Carmakers	11%

North America		
1.	JCI	38%
2.	Lear	33%
3.	Magna	10%
4.	Faurecia	3%

China		
1.	JCI	59%
2.	Lear	16%
3.	Faurecia	4%

Source: Faurecia

Throughout the 90s, seat suppliers had demonstrated that they could innovate and bring to production high-technology systems that increased vehicle comfort, safety and, most importantly, attractiveness to the end consumer. Car seats had evolved from simple objects on which the passengers sat to devices that contributed dramatically to the safety, comfort and aesthetics of the car and that could help differentiate one car model from another. It was estimated that seats represented approximately 5% of a car's value.

Seats were a source of constant technical change, with electronics and flexibility in use at the forefront of this change process. It was in the most advanced technical areas, e.g. heated, ventilated or cooled seats, memory seats, fold-flat and fully reclining seats, that the major changes were taking place.

Over time, new features were being added and many were fitted as standard; customers wanted added comfort and features once considered luxury. As these

features became standard, they lost the differentiation appeal they had offered. The effective commoditization of some technologies simply reinforced the pressure on the suppliers to apply new technologies to differentiate one carmaker's seats from another.

In 2005 the price of a car seat set varied from 200 euros for a very simple model to 2500 for a full options leather set, with an average price of 480 euros per vehicle.

Capital investments in the industry had become extremely high. Acquiring a new customer or a new program for an existing customer was very expensive: not only the selection, qualification and set-up processes could last up to three years during which heavy investments were required, but it could also mean the construction of a new JIT plant. Logistics imposed that the factory supplying complete seats had to be located only a short distance from the car assembly line. As an example, Faurecia had an impressive 160 industrial sites to supply parts to its customers!

Even if an existing plant was suitably located for the new program, major modifications to the manufacturing lines were required to host the new model. The required investment per program from the first discussion with the potential customer to the beginning of seat manufacturing could reach tens of million euros. Only very large and cash rich companies could afford these kinds of investments and mistakes were extremely expensive.

For tier one suppliers, being the partner of choice for a particular component was a key competitive position. While this could be founded on identification of business opportunities and anticipation of customer needs at very early stages of vehicle design, it also increasingly required suppliers to have global engineering and R&D capabilities and global manufacturing facilities so as to be able to serve a large number of customers in as many countries as possible.

4. The Technology and Manufacturing of Car Seats

A car seat, especially a front one, was a concentrate of technologies with many different components (refer to Exhibit 2).

4.1. The Development of a Car Seat

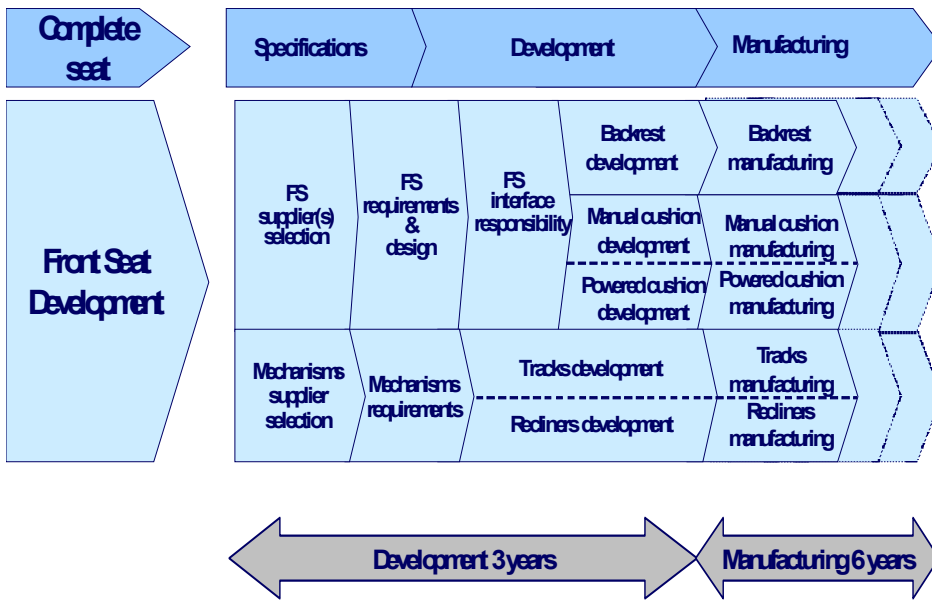
When a carmaker decided to develop a new car model or to renew an existing one, the process normally included the design of new seats.

To do so, the car manufacturer had two options: either they had the skills and resources to design and manufacture the seats in house (but this happened in only 4% of the cases), or they opened a tender and contacted several seat suppliers. In the second case, two further options were available. There were car manufacturers

who designed the seat in house and others who just presented the desired functional specifications (performance, volume and costing) and let the supplier do the entire development.

The typical interval from the request for proposals to suppliers to the beginning of manufacturing was three years. During this time, several steps took place (refer to Exhibits 5):

Exhibit 5: The lifecycle of a car seat (source: A.T. Kearney)



- The carmaker issued the call for proposal.
- The suppliers presented a "proof of concept" to the client, normally CAD designed models that included computer estimated functionalities and security checks.
- In parallel price negotiations took place.
- The supplier was then selected, the program awarded and the actual seat design work could start; in this phase sub-suppliers were identified and selected (eventually by the carmaker).
- Upon customer agreement, the final details of the design were completed and the tooling for volume production manufactured.

- The actual manufacturing started at the same time as the car production so that the first seats arrived at the car manufacturing line right on time with the first models of the new car.

Once in production, a car model was manufactured for six years on average and sales peaked after 18 months. During this time, carmakers normally did not change seat supplier; the relationship was therefore a long lasting and mutually binding one.

4.2. The Making of a Car Seat

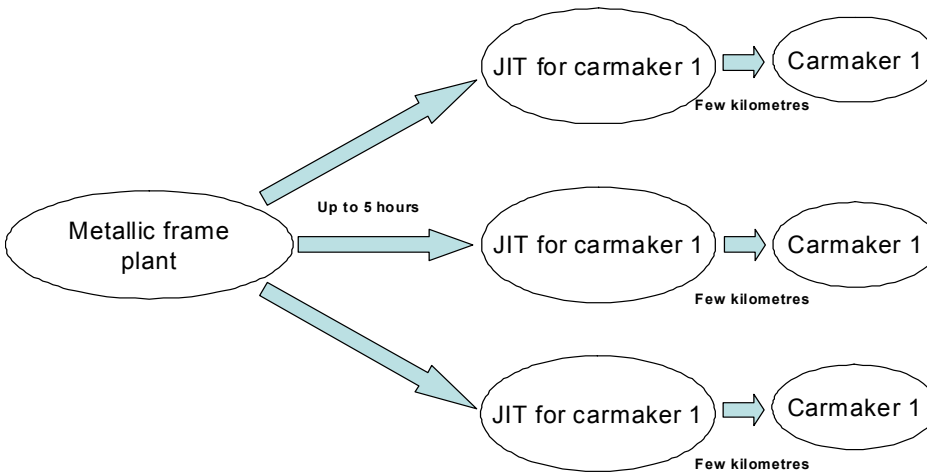
A car seat had essentially two main components: the metallic frame and the "soft" parts that included foams, fabric texture and color, air bags, plastic covers, electric motors and other options.

The manufacturing of the frame and the final assembly of the seat were always done in different plants and potentially by different companies. Therefore there were frame plants that delivered metal structures (that included all the metal parts and the recliner mechanisms) and "Just-In-Time" (JIT) plants, always located close to the car manufacturing factories, which coordinated and received parts from all suppliers and did the final assembly and on-time delivery.

JIT plants were required by the nature of the car industry. Carmakers accepted only a few minutes of inventory, and parts for the exact model moving along the line had to arrive at the right place at the right time. OEMs actually adopted a build to order strategy according to which a particular car was assembled upon a final customer order: when a customer ordered a car with a given set of options, the OEM launched its manufacturing. JIT delivery was required to enable the OEM to ship the car to the end-user within a reasonable delay.

Around the world there were far more JITs than frame plants, as the extremely short lead-time imposed the JIT to be close to the customer plant. Hence, metal structures had to be shipped from the frame plant to the JIT (refer to Exhibit 6) located near (and sometimes inside) the carmaker's factory for the assembly of the various seat components. The metallic structure could be delivered either in one or two parts (sometimes even more according to the recent unbundling of the seat by carmakers), in which case the cushion frame was separated from the backrest one; recliner mechanisms were usually attached to the cushion and, once bolted to the backrest, served as link between the two parts of the frame.

Exhibit 6: Typical shipment scheme



4.3. 1-Part vs. 2-Part Seats: A Strategic Choice

Until 2002 almost all structures delivered by Faurecia were in one part. This was essentially due to cost reasons: manufacturing structures in one part was less expensive as the recliner was welded on both the cushion and the backrest directly in the frame plant. Since welding was never performed in the JIT factory, shipping frames in two parts would have implied modifying the recliners in order to allow bolting the cushion to the backrest during assembly. As a consequence, the cost of the frame would have increased. This approach was also quite consistent with Faurecia original position as a supplier of "seat frames" to car makers who previously controlled the final assembly of seats and with a dense regional manufacturing footprint.

The situation changed with the evolution of the business model and the decision by Faurecia to operate JIT factories thus delivering complete seats to its customers wherever located. In this case, the total cost was not only the one of the frame, but also its transportation, the assembly and the tooling required to perform it. New contributions to the total cost had to be considered that impacted drastically the final result.

Furthermore, with the unbundling of the seat required by carmakers, suppliers had to develop subsystems to suit customers' demands while trying to standardize product offering: the supplier's goal was to contain costs wherever possible and reducing the number of products was a way to achieve it. In product terms, this meant the development of a set of standard "plug & play" modules that

properly combined fulfilled customers' needs. The seat was therefore becoming a customized product made assembling standard subsystems.

The difference between one- and two or more-part seat frames was considerable as it had numerous industrial implications and, therefore, moving from one to several parts was a strategic decision requiring a deep analysis.

4.4. The Role of the JIT Plants

Once in manufacturing, there could be up to 2000 different types of seats that fitted a single car model (e.g. Citroen Picasso), depending on fabric color, texture and other options.

Carmakers gave forecasts to seat suppliers about five days in advance, while the firm purchase order was placed no more than four hours before the seats had to be ready on the car assembly line. In other words, the supplier had just four hours to receive and process the order, assemble the full set of seats for a given car model and deliver it to the carmaker.

The supplier was responsible for JIT delivery, and shipment in advance was not permitted. In case of missed or wrong delivery, the supplier had to cover the costs of the delays induced along the line. If the line had to stop because of a supplier, the same supplier would have incurred serious penalties that included the wages of the operators whose work had been delayed.

Therefore a full set of countermeasures had to be put in place by suppliers to avoid any such event. A line manager at Faurecia's factory near Rennes, France, said:

> Our worst nightmare is to slow down the car manufacturing line. We have spare parts and alternatives for all our tools; we have planned alternative routes to ship our parts in case of heavy traffic or issues on the road. We are ready to clear the roads in case of snow, and we have spare trucks in case of accidents. We are ready to ship individual parts and even mock ups of seats to keep the car line moving.

Some of these precautions were not needed in the JIT plants integrated in the carmaker's factory, such as the Faurecia factory in Leipzig, Germany, located in the BMW plant. There seats were directly brought to the assembly line on the conveyor belt system of the factory.

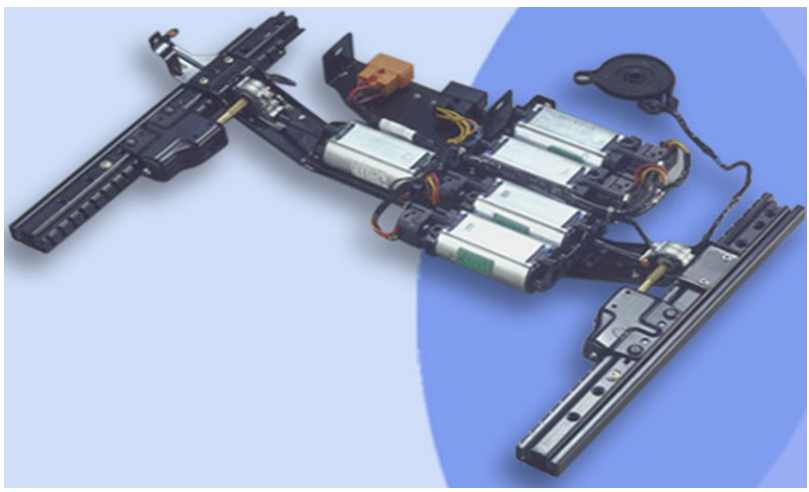
Tight deadlines and the willingness to contain inventory at the JIT induced seat manufacturers to strive to push diversity from one seat type to the other as downstream as possible in the seat assembly process. Having interchangeable plug & play modules for the frame certainly contributed to reach this goal.

4.5. Logistics and Ergonomics Issues

A metallic seat structure was a big and heavy object (refer to Exhibit 7) that needed to be packaged and shipped and then received, inspected and stocked before assembly. Despite the studies done to reduce the shipment volume and therefore cost, a Faurecia manufacturing manager working in a plant producing one-part seats said:

> We have been trying very hard to optimize the seats' packaging, and yet, in our trucks, we deliver quite a lot of air with some metal in it. The issue is becoming critical if we want to meet the costing structure required by our customers.

Exhibit 7: Front seat tracks and structure



Source: Faurecia

Also, once in the JIT, the inventory of components for assembly needed to be optimized and seat structures took up the largest part of the warehouses. From a logistics standpoint, it was therefore essential to address the issue represented by these bulky objects.

As to JIT plants, using one-part seat frames was becoming less and less practical with the increased complexity of seats and the more recent assembly techniques in use.

Historically the shop floor in an assembly factory was organized in islands where the frame was put on a pedestal that allowed rotations in all directions for the operators to fit it with the required components. The frame remained set on the same device until the accomplishment of the seat assembly. Therefore, the operators had to learn to perform all the operations required to assemble a full seat from the bare frame to the delivery to the car manufacturer. This required a lot of training, long set-up times and resulted in quality differences from one seat to another coming from a different island. Also, pedestals had to be customized for each type of frame; the tooling cost for the launch of a new manufacturing line was becoming prohibitive.

With the evolution of car seats and the increased number and variability of parts to be assembled on one seat, the number of operations to be performed during assembly increased and the JIT shop floor changed from islands to continuous flow lines: the frame entered the shop floor on one side of the line and kept moving on assembly lines on which operators, working in teams, added parts until it was ready to be shipped to the car manufacturer.

Each operator performed a limited number of operations and could focus on optimizing its tasks with a dramatic decrease in processing time.

Parts to be assembled on the frame were available in front of the operators within arm's length; workers did not need to turn or bend to take them.

A bare seat frame could weigh up to 12 kilos; the weight increased while the seat moved along the line and a complete seat weighed up to 25 kilos. Having abandoned the pedestal, the stress on operators who had to lift or rotate the seat could be huge; robots had therefore been introduced on the lines to perform this operation.

Seat assembly was thus a very labor-intensive manufacturing process with severe ergonomic issues that could result in potentially harmful effects on the operators and have costly consequences for the company.

4.6. Design for Assembly at Faurecia

In 2004, the automotive seating business unit of Faurecia launched an ambitious program that was bound to have a major impact on the seat design and manufacturing process: a Design For Assembly (DFA) team with the goal of

optimizing the assembly process, had been created to support all the steps of product design, development and manufacturing.

The rationale was simple: two products with an identical number of parts may differ in required assembly time by a factor of two or three. This is because the actual time to grasp, orient and insert a part depends on the part geometry and the required trajectory of the part insertion.

Not only the time required was critical, but also operators' comfort during their job was mandatory. Musculoskeletal troubles that cause health problems were a major concern in the JITs. In mere economic terms, the consequences were evident; not only were stressed workers generally less productive, but also the cost of absence due to health reasons was quite high.

DFA was a transversal process aimed at optimizing the activity and comfort of operators.

Mr. Pascal Connesson, DFA manager, said:

> We want to influence the design of our products in order to optimize the assembly process; we have designed the ideal assembly line for the JIT, one that optimizes ergonomics and assembly costing, and we want to adapt the product design to fit it. This is a dramatic revolution for Faurecia, as the focus had always been on the technical side, somehow neglecting the assembly process during manufacturing. Given the nature of car seat assembly, our target is to move the connection between the cushion and the backrest as far as possible in the assembly line.

4.7. Program Development at Faurecia

When a new program was started, the development team was typically composed of a program manager, nominated by and reporting to the Division Program Director, a finance controller to analyze product costing, a product engineer for the metallic structure and a manufacturing engineer to provide JIT expertise; sales, purchasing and quality experts were also part of the program core team.

The document that circulated in the team and that captured all the information about the product under development was called "Master Principles". Since the introduction of DFA, a new column had been added to the Master Principles to collect comments about the process.

DFA recommendations were sometimes as simple as the reminder not to leave sharp edges in the metallic structure that could harm the operator during assembly but could also consist in a deep ergonomic analysis of the operations to be accomplished in the JIT.

DFA's mission was to optimize operators' safety, comfort and quality of work, and their comments were highly considered all along the design chain. A red flag from DFA automatically implied a modification to the design of the product.

The early involvement of DFA was extremely important as, once the design was frozen and production tooling launched, only minor modifications were possible.

Among the scopes of DFA, there was the reduction and, possibly, the elimination of musculoskeletal troubles in manufacturing plants; the focus was therefore on ergonomics and physical efforts. As a consequence, DFA was strongly in favor of assembling the seats starting with two or more part frames and connecting the cushion and the backrest as far in the JIT assembly line as possible.

5. Organizing for Product Development

On December 31st 2004, the executive committee of Faurecia met to review the priorities for the upcoming year. At the top of the agenda was the need to redefine the product development process for the whole of the Faurecia Group. As the company gained market share, its engineering resources were becoming stretched and a new development process was required in order to maintain the momentum.

The challenges faced by car seating were actually quite illustrative of the type of issues confronting the whole company.

Certainly, the strategic move undertaken by Faurecia to become one of the world leaders in car seating was paying off. By 2005, Faurecia had become a global player with operations in all regions with significant car production. Its client list increasingly read like the who's who of the car industry: Toyota, BMW, VW, Renault, PSA, among others.

Also Faurecia's wide set of competencies, thanks to its presence in most activities of the car seating value network, meant that it had an increasingly rich contribution to its customers development.

Finally, as car became more complex systems incorporating a larger number of technologies, the role of car seating was becoming quite challenging. Not only was Faurecia supposed to stay abreast of the latest technology introduction, but it was expected to design faster a growing variety of seats.

It resulted that Faurecia had also become a "development" machine, pursuing simultaneously the engineering of a large number of car versions for a given model, at a time when it was engaged in support engineering for numerous programs for a large number of OEMs. The resources of car seating got inevitably strained under the overwhelming pressure from engineering needs. The system was quickly approaching its limits and incidents started to occur which required management time to fix:

- Some projects had suffered delays, causing costly catch up to prevent penalties imposed by contractual clauses.

- The allocation of resources (especially development engineers) for product development programs was not optimal, as it was the result of the relative bargaining power of project leaders rather than "objective needs".

- Problem resolution was not always as good as expected due to project team dynamics where some departments were more successful than others in imposing their "best solution".

- Sometimes, teams suffered from the "Not Invented Here" syndrome where suggestions from suppliers were simply ignored, making decisions on product development less effective.

It was clear that product development had become a key process and that Faurecia needed to set up a policy in line with best practices world wide.