

New car



**ASSIGN
BUSTER**

This case study presents the situation of a new car introduced to the European market. The car design and the brand name (Smart, a two-seater smaller than FIAT 500), the company (MCC owned by Daimler-Benz) and the supply chain are completely new in the market and go beyond such existing practices as supplier involvement, outsourcing and modular production in the industry. Modules such as complete front or rear ends are pre-assembled on site and suppliers are involved in design and final assembly through co-ownership of the site, co-design and some major share in the manufacturing activities. Given the untraditional approach, MCC executives face some fundamental challenges including how to manage and control a supply chain in which MCC only adds some 15% of the operational value added. MCC can be seen as a pilot for implementing mass-customisation in an automotive supply chain. The case study is therefore of relevance to academics and (automotive) practitioners. Therefore, the supply chain should reduce inflexibility, cost and lead-time while maximizing on responsiveness, innovativeness and quality. The Smart is based on an integral body-frame (called "TRIDION") to which modules are attached. Apart from the body, the car consists of several main modules, namely: the rear module including the driveline, the doors and the cockpit, each containing sub-modules and components. The modules are supplied in sequence for final assembly, by a small number of first tier suppliers, of who seven are fully integrated in the final assembly site. Modules are bought by the MCC only as they are needed in the final assembly process. For example, a complete rear module, including among other things: rear axles, transmission, suspension and engine, is pre-assembled by one supplier who starts assembling the module only upon demand by MCC and not earlier than one and half hour before the

module is needed on the final assembly line. The same is true of the doors (3 hours lead-time) and the dashboard system (1-hour lead-time). To ensure a smooth flow of goods within the plant, the car is moved along the work stations of the assembly line, which is laid out in the form of a cross.

Arguments for this plant layout were to permit high-frequency deliveries at a large number of offloading ramps, while keeping transport to a minimum.

Sub-sections can also work independently to avoid system disruptions in case of malfunction at one particular point along the assembly line.

Furthermore "integrated suppliers" are able to supply their finished products directly to the final assembly line or on a conveyor system.

In the "Smart-ville" the manufacturing process starts with Magna assembling the body (TRIDION) in white. This process is highly automated and standardized; Magna employs 130 robots. In fact, this is one of the very few automated process steps. Operators mostly perform subsequent steps. The finished body in white is then passed on to the next partner in the adjoining, connected facility. In that step Surtema (an Eisenmann subsidiary) primes and paints the body using paint tunnels for each of the two colors (black and silver/grey). The process is based on powder-coating; it has been developed especially for Smart and is environment friendly. After painting, the body is transferred by conveyor belt to the beginning of the cross shaped assembly line. Starting at the top of the cross, VDO assembles cockpits and mounts them to the body.

In the three other sections of the cross MCC goes on assembling the car, starting with the mechanics and chassis, followed by external and internal trim assembly, inspection and testing. The rear module (including the drive

train) is pre-assembled by Krupp Hoesch and undergoes several additional assembly tasks by workers of MCC on a small island adjacent to the cross. Following assembly, the rear module is brought to the line on a telescopic carrier that raises it to shoulder height, enabling operators to guide it into the car. During the assembly process, modules and components are delivered line-side (within 10 metres from the workstation) on a just-in-time basis. For example, complete front-end and rear-end modules are delivered by Bosch and Krupp, respectively. Dynamit Nobel delivers the plastic outer body panels moulded on site. The door panels are delivered to Magna Door Systems who pre-assembles the panels to complete doors, before delivering them line-side. The seven "integrated" suppliers are responsible for the supply of 70-80% of the volume and 30-40% of the value of the finished product. In addition, 16 non-integrated suppliers deliver sub-modules and parts to both MCC and the "integrated" suppliers. These non-integrated suppliers add about another 20% of the volume to the car. Their supplies such as seats, wheels, windows, are delivered to the relevant docking station of the assembly line, at a maximum distance of 10 metres. The remaining 10% of the volume consist of standard and small parts not linked to a particular module, which are stored in an on-site warehouse, operated by a third party. MCC has selected suppliers to integrate at the site and suppliers that could supply from a distant location by a straightforward process.

Logistic management of MCC made a calculation based on the frequency at which a module was used, and its size. The outcome of this exercise showed the volume of the various flows of components. Apart from special cases in which the characteristics of the manufacturing process did not allow on-site assembly (as with engines); the components causing the largest transport

flows were integrated in the premises of MCC. This table lists the integrated and non-integrated suppliers of MCC.