



# Automotive Engineering *Solutions*

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# Automotive Engineering **Solutions**

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*Engineering a better world*

## We believe it's our people that make ***the difference***

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*Designing and engineering products that change the world, improving efficiency and safety, environmental impact and time-to-market. We work with our customers to realize their vision, providing resources and services to get them from where they are today to where they want to be tomorrow.*



Our customers are making more products, faster and better than ever before and it's the millions of people who benefit from those products we help to make that inspires us to constantly innovate, develop better solutions and deliver a better experience for everyone.



*We work with our customers to realize their vision, providing solutions and resources to get them from where they are today to where they want to be tomorrow.*



## Why Tata Technologies?

# Product Development is at the core of **everything we do**

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***Global presence and diverse resource pool to deliver complex product development programmes cost effectively helping customers realize better products***

Our Globally Distributed Execution Model (GDEM) with a balanced approach between onshore customer intimacy, and offshore capacity and cost-effectiveness in delivering complex projects has been recognized by our Customers and Analysts.



***End-to-end product management offering leveraging our product engineering expertise to deliver IT solutions to the manufacturing industry which help realize better products***

Deep industry knowledge of product development combined with an intelligently different approach to technology and IT solutions that enable our clients realize better products that are better, faster, safer, greener, and experiential.



***Established frameworks based on our expertise to reduce development time***

Deep knowledge of the enterprise solutions and the manufacturing industry has helped us build frameworks that reduce the turnaround time for the customers by 30-40%.



***Partnerships and alliances with the best in the industry***

Our strategic alliances with the best in the industry, including the likes of PTC and Siemens, ensure innovative solutions to help our clients take the industry challenges head on, prepare for the future and deliver better products.



Our Core Services

# Engineering services for the manufacturing sector

Tata Technologies - a leader in **product engineering services** - caters to the global manufacturing industry; enabling ambitious manufacturing companies to design and build better products.



## Engineering, Research & Development

Provide outsourced engineering services for our manufacturing customers globally to help them conceive, design, develop and realize better products.



## Digital Enterprise Solutions

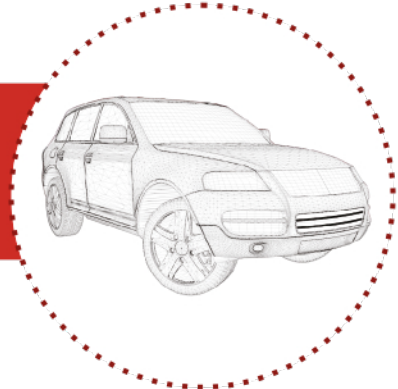
Help manufacturing customers identify and deploy emerging technologies, tools and solutions to manufacture, service and realize better products.



# Core Domains in the Automotive Industry



MARKET DEFINITION & PRODUCT STRATEGY



CONCEPT, STYLING & VEHICLE ARCHITECTURE



DETAILED ENGINEERING & DESIGN



PRODUCT & PROCESS VALIDATION



PRODUCTION READINESS



MANUFACTURING PROCESS & RESOURCE PLANNING



PRODUCTION LAUNCH & CONTINUOUS IMPROVEMENT





**OFF-SHORE**

- Off-shore PMO • Design & Development • Simulation Activities
- Manufacturing Execution • Resource Management

**NEAR-SHORE**

- Senior Engineers • Lead Design Engineers • Lead Process & Methods Lead
- Data Management • Delivery Quality

**ON-SITE**

- On-site PMO • EM & Liaison Lead • Project Reviews • KPI Reporting
- Supply Chain Management

*Off-shore Engineering Services*

## We are a pioneer of global **engineering outsourcing**

*We developed the benchmark process for global off-shore delivery of engineering services 25 years ago. This experience, combined with streamlined processes and practices enables us to quickly deploy off-shore teams to develop or directly connect with existing PLM, data management and company-wide systems.*

Our Global Delivery Execution Model (GDEM) ensures that off-shore activity is invisible to the on-site, client technical centre. Team members on-site manage the distribution of work and the Tata Technologies technical lead will assign this to the off-shore engineering and design resources as well as having the responsibility for cultural liaison and the quality of work.

Managing and delivering projects in this way means that local workloads and project management becomes inherently non-geographic. On-site and near-shore teams instantly feel at home dealing with off-shore resources. There are no technical barriers and in some situations work is able to continue around the clock, enabling completion of tasks and projects in record time.



*Our workforce, comprising thousands of skilled designers, engineers and program managers, is the best in the business.*

## Automotive Product Development

# Setting the standard in **Automotive Engineering**

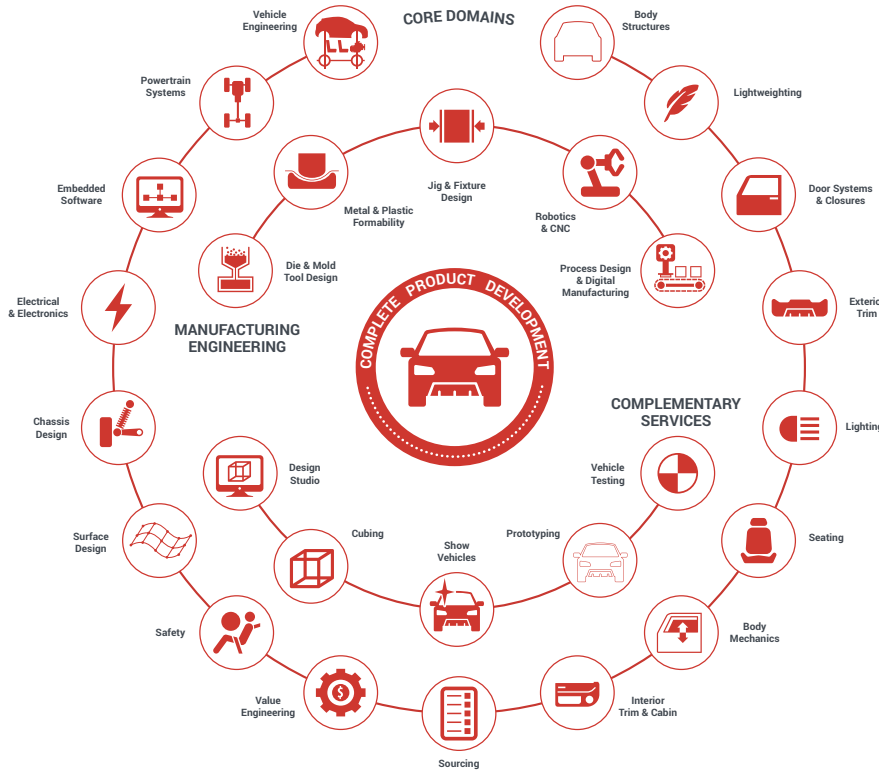
*Tata Technologies helps automakers design, engineer and validate the vehicles of the future. Our engineering and design services provide clients with the capacity to innovate, creating new products; from components to full vehicles. Our workforce, comprising thousands of skilled designers, engineers and program managers, is the best in the business.*

This extensive knowledge and experience is accessed through our Global Delivery Execution Model (GDEM), combining off-shore, near-shore and on-site talent for optimal execution of design and engineering programs.

Whatever your project requirements, you can be assured that Tata Technologies has

the skills, knowledge and resources to realize the full potential of every task. From small-scale IT implementations to complete product development, our experts are equipped to design, develop and engineer solutions that you can count on.

# Automotive Engineering Capabilities



Automotive capabilities throughout our core domains, manufacturing engineering and complementary services, enable complete automotive product development. Working with our customers we use best in-class processes, tools and technologies, providing better access to our global skill base (including domain experts) with fast response times in a tailor-made or turnkey, value-driven package.

## Interiors

- Seat Systems
- Restraints & Airbags
- Instrument Panel & Console
- HVAC & Distribution
- Cabin and Loadspace Trim
- Closure Trim

## Closures & Exterior Trim

- Doors
- Hoods and Fenders
- Tailgates
- Glass
- Sealing
- Wash Wipe Systems
- Bumpers
- Functional Black Trim
- Lighting
- Carbon Fibre Closures
- SMC Closures
- Closure Mounted Trim
- Exterior Ornamentation

## PMO / ENVA

- Program Management
- Business Process Outsourcing
- Essential Non-Value Added Services

## Computer Aided Engineering

- FE Model Creation
- NVH
- Durability
- Structural Crash Analysis
- Occupant Crash Analysis
- Pedestrian Crash Analysis
- Multi-body Dynamics
- CFD
- Moldflow Simulation
- Systems / 1D Simulation

## Body Structures

- Front End Structure
- Main Floor
- Rear Floor Structure

## Chassis

- Chassis Architecture
- Chassis Tuning
- Chassis Dynamics
- Chassis Integration

## Complimentary Services

- Vehicle Testing
- Prototyping
- Show Vehicles
- Cubing
- Design Studio

## Power Systems

- Air Intake Systems
- Fuel Systems
- Exhaust Systems
- Powertrain Cooling Systems
- IC Engines - Development
- Transmissions & Driveline
- Emissions
- Calibration
- Alternative Propulsion Systems

## Electrical, Electronics & Embedded

- EE Integration
- Component Development
- EE Connected Systems
- EE Energy
- EE Autonomous

## Manufacturing Engineering

- Virtual Manufacturing
- Factory Flow Simulations
- Process Flow Simulations
- Die and Mold Design
- Metal and Plastic Formability
- Jig and Fixture Design
- Robotics and CNC
- Ergonomics and tooling access studies

## Virtual Vehicle Integration

- Studio Engineering Support - Surface Feasibility
- Whole Vehicle Package and Architecture
- Occupant Package
- Design Solution Attribute Entitlement - DS Feasibility
- Optical Quality Development - Engineering and Studio
- Digital Mock-Up
- Digital Pre-Assembly
- Whole Vehicle Integration Using Hard Points Manual
- Dimensional Management - DVA and Geometrical Specification
- Manage Block Meeting Review Process
- Benchmarking

## Physical Vehicle Integration

- Teardown and Benchmarking
- Should Costing
- Component Testing
- Vehicle Testing
- Homologation
- Prototyping
- Vehicle Attribute Development



*Better Solutions for the Automotive Industry*

## **Improving** engineering, design and manufacturing

*Our combination of deep industry knowledge, breadth of value proposition and a proven Globally Distributed Execution Model (GDEM) positions Tata Technologies as the premier product development and manufacturing execution partner for the industries we serve.*

The Tata Technologies value proposition is presented as a portfolio of Better Solutions, utilizing the full value of a technology-driven workflow to enable our clients to enjoy more products, delivered faster and better. Each can benefit independently, however when an

organization pursues optimization across the complete product realization lifecycle, then people, processes and technology can be combined to achieve the seamless execution of product and manufacturing goals.



*Right Performance*

+



*Right Price*

=



*Right Material*

+



*Right Amount*

+



*Right Place*

Tata Technologies has played a key role in how manufacturers around the world approach lightweighting with our 5R Rightweighting methodology; a tried and tested formula that delivers the right performance at the right price, by applying the right amount of the right material in the right place.

## Research & Development

### Expanded R&D Capabilities Fostering Innovation

*Tata Technologies' R&D capabilities are expanding and include new material research, lightweighting methodologies, leveraging teardown and benchmark data and business analytics.*

- Identifying areas to generate value in research and development projects.
- Optimizing innovation and development of smart technologies.
- Developing cutting-edge solutions using analytical methods.
- Defining areas to improve effectiveness of services.

## Product Digitalization

### Going Digital Across the Entire Product Realization Lifecycle

*Proven methodologies for enabling digitalization and implementation of PLM solutions across the extended enterprise. Supported by our experience in using and configuring PLM technologies in addition to leveraging new IT infrastructure, cloud, big data, and the Internet of Things (IoT).*

- Defining strategies to reconnect management with products, enabling visual decision-making with automated reporting and real-time analytics.
- Aligning people, processes and technology which includes learning and skill development programs.
- Enabling smart, virtual and digital factories (towards Industry 4.0).
- Defining PLM and IT integration landscape, technical architecture, digital roadmaps, enabling IT legacy application retirement strategies.

## Effective Collaboration

### Optimizing Digital Product Data for Better Knowledge Management

*Tata Technologies brings capabilities around data integration and optimization to provide a platform for knowledge and information sharing across all business functions. This helps to bridge organizational silos to ensure that integrated teams have up-to-date and accurate data, enabling them to make better decisions.*

- Defining enterprise data models, standardising common message models, security policies, corporate IT standards and governance.
- Converting data into intelligent information, coupled with feedback loop learning mechanisms.
- Leveraging cloud, big data, IoT and hyper-connectivity to enable data mining and traceability.
- Implementing data migration solutions (Extract-Transform-Load framework).

## Right Sourcing

### Designing and Implementing Demand Fulfilment Strategies

*Tata Technologies helps businesses optimise valuable and scarce engineering resources. Using proven models leveraging globally distributed engineering talent and capacity, we define and implement sourcing strategies to free up the capacity to create and innovate.*

- Identifying core and non-core activities to define effective sourcing strategies.
- Identifying sources of value addition, including essential non value-added (ENVA) activities through our proven strategies.
- Mapping skills with organizational structures from formal and informal roles and responsibilities.
- Defining change roadmaps to maximize product creation and innovation activities.

## Business Transformation

### An Intelligent Approach to Automotive Business Transformation

*Collaborating in a customer's digital journey with an innovative approach and incorporating best industry practices (Dev Ops and Agile) through Digital Customer Experiences, IIOT Solutions, Digital Manufacturing Automation, Next Gen ERP and supply chain solutions, Analytics, Mobility and Connected platforms.*

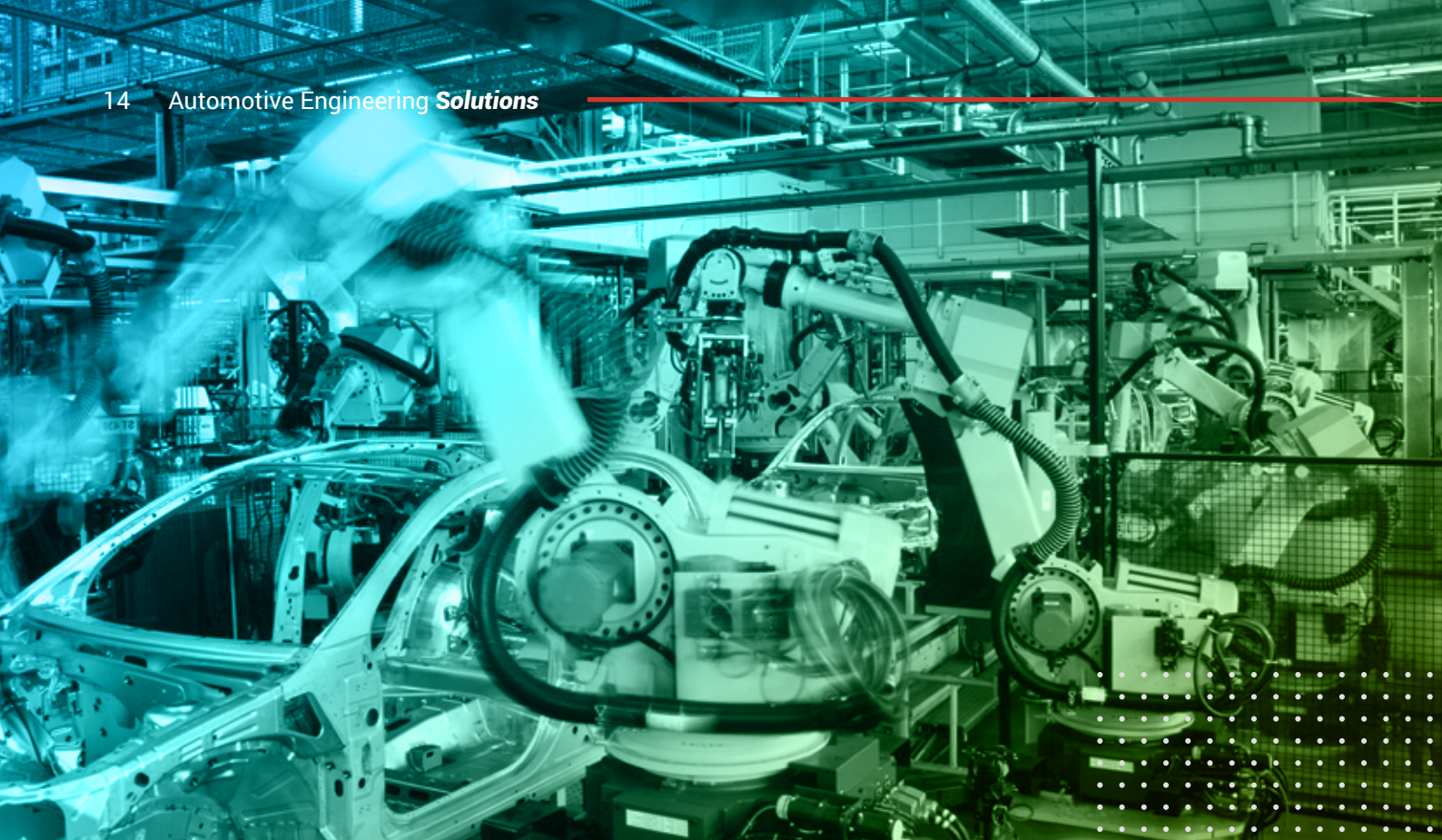
- Well defined project schedules, charters and project management plans, along with the establishment of local project organization and relevant working committees.
- Build and Test (BAT) of all business process requirements based on a formulated blueprint.
- Finalization of the project "go-live" stage by ensuring complete preparation through business support activities.

## Global Engineering Services

### Global Engineering Talent At Your Fingertips

*Tata Technologies provides access to global talent and capacity to deliver "best-in-class" operations for cost-effective, global on/off-shore engineering centres in a dedicated or shared engagement model depending on your needs.*

- Assessing product design and manufacturing engineers to establish what are core & non-core activities.
- Defining and implementing Global Engineering Centres (GECs), near-site, near-shore or offshore with best in class processes and operations for collaborative outsourcing.
- Optimizing skill usage against existing processes and tools to improve operations.



## Case Studies

# Delivering **results**, manufacturing **success**

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*As a pioneer of technology solutions within the automotive sector, Tata Technologies measures success against that of our clients. Analyzing the impact of our work in attaining their goals, exceeding expectations and delivering real results.*

These case studies are just some of the hundreds of success stories we have enjoyed over the past 25 years. They demonstrate the capabilities present throughout our organization, how they work seamlessly with one another and how we pioneer new technologies for our customers around the world.

It's this expertise in automotive engineering that enables us to deliver more products, faster and better than ever before. Driving efficiencies throughout the engineering chain, from conception to launch and beyond.

# Complete EV Program

## NIO ES8 Premium Electric Vehicle

***NIO is a well-established new generation Auto OEM in China. ES8 is the first electric vehicle manufactured by NIO, which went on sale in the Chinese market in 2018.***

Tata Technologies engaged with NIO right from the beginning of the ES8 program in mid-2015, providing support in Body Structures, Closures and Exteriors. The program support then extended to AME, CAE, Battery Swapping, PLM, and Electrical & Embedded. At the peak, there were 120 employee resources engaged in the ES8 Body Engineering program, offering on-site as well as off-shore support.



## Challenge

- Introduce a brand-new technology to the market
- Deliver best-in-class range targets
- Meet and exceed performance targets for the vehicle
- Provide a statement in engineering to put NIO “on the map”
- Be first to market
- Provide a complete vehicle program with the client’s small in-house team
- Client’s lack of experience in lightweight car bodies



***Patented “quick swap” battery system devised and developed by Tata Technologies.***

## Solution

- Tata Technologies owned most of the key deliverables related to Body Engineering.
- The team used extensive lightweighting experience and our 5R’s methodology to provide the right-weight-cost-performance balance to the body structures of the ES8 program.
- Managing the program to ensure appropriate ramp-up of team against challenging timelines.

## Result



- ✓ Time-to-market was world-class (Initial Product Definition to Production Release in 12 months)
- ✓ World-class lightweighting Indices (applying Euro Car Body measurement method)
- ✓ Stiff body torsional and patented “quick swap” battery system devised and developed by Tata Technologies
- ✓ Use of multi-material joining methods and High Strength aluminum to China mainstream cars

# Product Development Program

## High Volume Passenger Vehicle

*The program was a milestone for the Indian engineering services market as it was the first time a full vehicle had been outsourced to the Indian private sector.*

The company is an internationally reputed Auto OEM offering world-class premium products in the global market. The company's headquarters are located in the UK and they employ over 30,000 people across the world.

## Challenge

- Developing a new product to replace the company's existing model
- Taking full external ownership for vehicle engineering, design and development
- Identifying and defining the necessary execution model for turnkey program delivery
- Managing the entire supply chain
- Increasing passenger capacity without increasing footprint
- Understanding that the client had never outsourced a program to this degree before



*Everything you can see, and everything you can touch, has been executed by Tata Technologies.*

-Chief Program Engineer (An Internationally Reputed Automotive OEM)



## Solution

- Delivered a new mid-size SUV to replace one of the client's previous models.
- The scope was extended from concept to production launch, including engineering management.
- Delivered many of the systems and subsystems including overall program management and the complex challenge of system and zone integration.
- The team managed all of the supply chain contributors and the entire validation and launch process for the vehicle.
- Used our Global Delivery Model (GDM) to deliver the project.

## Result



- ✓ Body engineering investment was 25% less than if done in-house
- ✓ 7-seat layout in a typical 5-seat footprint
- ✓ The program was delivered on time
- ✓ The resulting vehicle beat quality targets



# PLM 3DExperience Implementation

All Electric SUV Manufacturer

*A global EV start-up specializing in high-performance, premium electric, autonomous vehicles, based in China. From its very inception to launching its first electric SUV, Tata Technologies has propelled the company through PLM services at every stage.*

With the design for their new SUV all set, it was a huge challenge to pull off the dream with 'Teamcenter 10.2'.

## Challenge

- Migration from Teamcenter 10.2 to 3DExperience 2016x
- Stringent timeline (3 months)
- Full-scale implementation of PLM solution
- Get a revolutionary new vehicle into production



*I have never seen or heard of any company implementing a PLM system in just 4 months in my 25+ years of professional life but Tata Technologies managed to pull it off.*

- Chief Information Officer (Global EV Startup)

## Solution

- The entire implementation scenario was deftly split into five key domains: Product Configuration, Data Release/Change Management, Enterprise BOM, Product Design and Collaboration and Digital Manufacturing.
- Novel implementation, migration and PLM transition strategy along with methodized Organizational Change Management (OCM) and deployment planning supported by domain experts and solution architects.
- Developing in-house deployment tools for swift execution.
- A tightly interwoven execution model, dedicated PMO and on-site & offshore delivery service models are the reasons behind the success of this project.

## Result



- ✓ Implementing a new PLM System
- ✓ Migrating complete production data for two vehicles from CATIA V5 to CATIA V6
- ✓ Zero impact on the vehicle production timeline
- ✓ Delivered in record time

# Customer Experience Management (CXM)

Japanese Automobile and Motorcycle Manufacturer

*Tata Technologies was instrumental in supporting this automotive giant by implementing a customized IT system that ensured synchronization between dealers and customers while ensuring customer satisfaction as the pivot.*

A Japanese public multinational - a manufacturer of automobiles, motorcycles and power equipment - that has been operational since 1959. The client was confronted by an issue of synchronisation between their pivotal business operation units.

## Challenge

- Quick turnaround time for system integration
- Challenge of rapidly expanding channel partners
- Application availability for 2000+ touch points
- Data management and claim cycle reduction



*Tata Technologies was instrumental in supporting this automotive giant by implementing a customized IT system.*



## Solution

- Instrumental in creating an application that managed critical transactional elements.
- Built an analytical application that complemented the transactional application created.
- Implemented a pilot project with multiple dealers associated with the client.
- Incorporated critical feedback from the pilot project and actionable recommendations were acted upon.
- A distributed help desk management system was developed to ascertain a customer-centric approach to business.

## Result



- ✓ Last mile inventory connectivity deduced
- ✓ Close to 450,000 vehicles sold per month
- ✓ 2 million+ vehicles serviced per month
- ✓ An expected 1000 dealers to be added within the current set-up in the future

Our Operations

# Engineering services for the manufacturing sector

Tata Technologies is a global engineering and product development digital services company focused on fulfilling its mission of helping the world drive, fly, build and farm by enabling manufacturing clients across the automotive, industrial machinery and aerospace verticals realize better products and drive efficiencies in their businesses, leading to the development of products which are better for the end customer, environment and society at large.

There are two components to the company's value proposition; the first one being outsourced product engineering services for our clients helping them conceptualize, design and develop better products, and the second one is helping them identify and deploy technologies and solutions that are used to manufacture, service and realize better products. These offerings are delivered through two lines of business: a) Engineering, Research and Development (ER&D) services, and b) Digital Enterprise Solutions which includes offerings in Connected Enterprise IT (CEIT) and Product Lifecycle Management (PLM) services and products.

We are committed to 'Engineering a better world' through collaborative innovation and adoption of sustainable technologies and processes. Tata Technologies has over 8600 employees serving clients across three continents through our uniquely balanced on-shore/offshore global delivery model that enables us to provide aligned on-shore customer proximity required to support the iterative nature of product development services together with the capacity and cost-effectiveness of offshore locations.



**8,600+**  
Professionals



**3 Active Regions**  
Europe, North America,  
Asia Pacific



**17 Global Delivery Centers**  
USA (Headcount: 429) - Troy, Detroit |  
Europe (Headcount: 1325) - Warwick  
(UK), Gothenburg (Sweden), Brasov,  
Craiova & Iasi (Romania) | India  
(Headcount: 6727) - New Delhi, Blue  
Ridge & Hinjawadi - Pune, Bengaluru,  
Thane | China (Headcount: 86)  
-Shanghai (China) | SEA (Headcount:  
56) - Tokyo (Japan), Bangkok  
(Thailand), Singapore

**\$400M USD**  
**CONSOLIDATED REVENUE**

USA	UK	Sweden	Romania	India	Thailand	Singapore	China	Japan
Detroit Troy, Detroit	Warwick	Gothenburg	Brasov Craiova Iasi	New Delhi BlueRidge, Pune Hinjawadi, Pune Bengaluru Thane	Bangkok	Singapore	Shanghai	Tokyo





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