

# Tata Elxsi offers innovative solutions in emerging technologies

**Works with OEMs and suppliers to bring Connected, Autonomous and EVs to their product portfolio.**

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**T**ata Elxsi, a global provider of design and technology services for automotive engineering solutions, is working with the top OEMs and suppliers by providing technology consulting, new product design, development, and testing. It provides solutions

in emerging technologies like IoT, big data analytics, cloud mobility, artificial intelligence, machine learning, augmented and virtual reality.

Tata Elxsi is also working with the OEMs that plan to bring Connected, Autonomous and Electric vehicles to their product-mix. It is working with them in their advanced EV programmes for development and validation systems. The company is a strategic partner of 14 of the top 20 global OEMs. Its work with car manufactures includes ECU specification development support, providing software

ownership incorporating the latest model-based design techniques and AUTOSAR standards, and as a test house where it is providing component and system-level validation of ECUs. Technology-wise Tata Elxsi is working closely with OEMs for active safety and autonomous driving, advanced infotainment development and testing, helping OEMs in coming up with their V2X strategy and supporting in various electric vehicle programmes.

Tata Elxsi through its eCockpit solution is addressing the growing connectivity requirements of OEMs



by developing the software for digital cockpit that incorporates multiple features of traditional infotainment, cluster and heads-up display from single ECU controller and OTA.

“Multiple active safety features like lane keep assist, blind spot detection, driver monitoring, surround view camera etc along with autonomous driving features are being introduced by the OEMs. Tata Elxsi is closely working with them and the Tier-1 suppliers in such projects. When electric vehicle comes to the mainstream, its testing becomes very important. Our eMobility HILS framework will help an OEM test the EV and the associated components at a faster pace at lower cost. We are also working directly with the commercial and agricultural equipment manufacturers and through their component suppliers for various projects in telematics, active safety and autonomous programmes,” Shaju S, General Manager and Head of Automotive Business Unit, Tata Elxsi, told Auto Components India.

Tata Elxsi follows the automotive ECU development process and standards warranted by all major global OEMs in the design, development, review and validation of its products. “This process ensures the robustness of our work products to withstand all the harsh conditions like snow, rain, wind and hot climates. Each component in a vehicle is designed to withstand the extreme conditions in which it will be used and this will be one of the non-functional requirements to the design team. All these aspects will be considered during the product development cycle and will undergo a rigorous validation testing to ensure the conformity. Normally the prevention of mud and dust particles entering into

the electronics is defined as an IP (Ingress Protection) rating for the box design. IP rating has different levels and depends on the mounting location of the ECU in the vehicle,” he said.

Along with the manufacturing plants, today most of the global OEMs and suppliers have invested in their own R&D facilities in India. They are driving innovation teams that come up with cutting-edge technology products for global car product-line as India is becoming the cornerstone of innovation and an exporter of automotives to the global markets.

The Indian car market is poised for tremendous growth as now the consumers are increasingly demanding for more safe and consumer-friendly features in their cars. This will lead to increased demand and development of electronics with intelligent functions. Today advanced features like telematics, driver assistance like parking assists, along with in-vehicle infotainment and enhanced fuel efficiency etc, are introduced in the Indian cars, thanks to the growing electronics presence. There is a wider adoption of Electronic Control Units (ECU) by car manufacturers and due to which the overall software content inside the car is increasing. This trend will continue and Indian cars will come with features equivalent to the European or the US cars in the near future.

“Our team works with global OEMs on advanced harnessing technologies, leading to weight reduction. Our electronics software and hardware design team enables the OEM or supplier to consolidate and reduce the number of ECUs in the vehicle, thereby also reducing the harnessing requirements. Lightweighting is seen as a global

trend among car manufacturers as this leads to improved fuel efficiency. Tata Elxsi’s Electrical Distribution system (EDS) team is working with OEMs for vehicle EDS design, development and integration of electrical and electronic architecture. We are exposed to global programmes and working with OEMs and wiring harness suppliers for EDS engineering support thereby helping them optimise the wiring harness and help reduce the overall vehicle weight,” Shaju said.

### □ Energy efficiency

The ECU power consumption is dependent on the vehicle battery and is managed by the various power modes like Run mode, Sleep mode and Deep sleep mode. The power consumption for the Run mode will be the maximum and the ECU will be in Run mode only when the engine is in start condition and the vehicle alternator is on. The Sleep mode or Deep sleep modes will be defined when the engine is in off condition and will have stringent power consumption in micro amps range (eg: 100uA or so). “Our design looks for the lowest possible quiescent current for the ECUs we undertake to design,” he said.

Tata Elxsi looks also into the costing aspect of the ECU since cost is a challenge for the Indian market. As the number of ECU features increases, the cost will also go high, as the system design will be complicated. Scalable and robust platforms are required to meet the cost pressure from OEMs and customisation with minimal changes for future requirements needs to be done. Functional safety standards demand more protection and hence more cost.

### □ Safety

Tata Elxsi is experienced in the

development of safety critical systems across multiple automotive domains. The functional safety team of the company works with the automotive players helping them in addressing the possible hazards caused by malfunctioned behaviour of E/E safety-related systems by providing ISO26262-compliant software and hardware development and consultations.

On the safety front, Shaju said, "We are working on both passive safety systems like locking controls, airbag controllers, passive entry, passive start etc. On active safety, we work on both camera and sensor-based systems for providing advanced safety solutions. Some of the works include surround view camera, proximity warning, cruise control, and driver monitoring."

The size of software present in a modern day high-end car will be well over 100 million lines of code. Moreover, technology is moving towards driverless cars and hybrid electric vehicles. In this way, electronic systems have become an increasingly large component of the cost of an automobile. Electronics are prone to failure; hence, it is very important to upgrade offerings to provide fail-safe safety technologies which ensure the passenger/occupant safety.

### ❑ Electric vehicles

Electrification of vehicles is an area

where Tata Elxsi is heavily involved in providing software development, system development and validation for battery management system (BMS), charging systems, hybrid control units, range extenders, DC-DC converter, inverters and more. It has also developed modular and scalable BMS software with optimised cell-balancing system that can address all the future electrification needs.

As many countries are bringing in regulations and investing heavily to phase out fossil fuel vehicles between 2025 and 2040, Tata Elxsi is developing a unique test infrastructure coined as eMobility HILS that allows OEMs or suppliers to test rapidly the EV and other associated ECU components at a faster pace and at less cost. It has also own battery management software IP which can be readily used for any EV programme.

Wide acceptance of electric vehicle over IC engines would lead to introduction of newer vehicle models with EV. This would require OEM's to have a quick and efficient validation of systems within vehicle. Interconnectivity of electric system with other vehicle systems plays a critical role in terms of safety and reliability. Customers would be looking for more efficient electric vehicle with more range/charge. Cost of the complete testing infrastructure would be extremely high and huge investments required for tools, frameworks, hardware and software. Testing of EV components, interconnected with ADAS/autonomous, infotainment and telematics sub systems, requires enormous test scenarios.

Tata Elxsi's innovative solutions also address the areas of connected cars, and autonomous driving. For connected cars, its focus is on in-vehicle infotainment, and

telematics and V2X. It has also developed an integrated eCockpit solution, which enables ECU consolidation. The company is also working on advanced concepts like Software Over the air updates, multimodal HMI and also bringing in AI-enabled vehicle remote diagnostics and prognostics.

"We have been working on a driverless car solution for quite a few years and have now developed our own intelligent autonomous middleware platform, Autonomai – based on AI and Deep-learning algorithms. We also have ready-to-deploy ADAS algorithms such as 3D-surround view system, camera monitoring system and driver monitoring system and more, which address the current need of L1, L2 and L3 levels of autonomy," Shaju said.

### ❑ The challenges

Tata Elxsi is a technology-led design services company and is in the forefront of innovations. "Still there are challenges, which we are not yet fully scaled up in-house to address. This applies to areas like cyber security, which is becoming an advanced requirement for most OEMs. As the software content is increasing, the ECUs are becoming increasingly exposed to malicious hacks from external parties. Making the ECU secure is a challenging task and for addressing this we have entered into a partnership with Irdeto, leader in cyber security who provides secure in-car display systems for automakers. Technology Partnerships is a key initiative from our side to bring in more synergy and address our global customer requirements efficiently. We have taken these steps to be able to provide a seamless and ideal solution to our customers, and this is what makes us an industry leader and preferred partner for our clients in this industry," he said.



## INTERACTION

**"We work with key players to produce futuristic, intuitive solutions," Shaju S, GM and Head of ABU, Tata Elxsi.**



**Q: How does Tata Elxsi's partnership with DiSTI Corporation Florida, USA, perform?**

**Shaju:** We announced this partnership in 2017 to deliver DiSTI's GL Studio products with Tata Elxsi software services especially on the eCockpit demonstrator. We had a joint showcasing of this demo in multiple global events like Consumer Electronic Show and Embedded World 2017. There are interactions happening between DiSTI and Tata Elxsi on how we can scale up the offerings and we have opportunities where both can work together for various customer projects. We are certainly confident about this partnership since there are more advancements happening in the areas of digital cockpit, and HMI will continue to play a key role.

**Q: Is there any upcoming interface solutions providing futuristic HMI design?**

**Shaju:** We have designed and developed an innovative next-gen eCockpit powering both instrument cluster and infotainment and developed complex multi-modal HMIs like voice, touch / gesture-enabled interfaces, to designing concept car HMIs showcased at various auto shows globally for international OEMs and Tier-1 suppliers. We are continuing to work with the key players for bringing futuristic and intuitive solutions.

**Q: What's the update on your prototype project for a driverless car?**

**Shaju:** The development of Autonomai, an AI-based solution and our trademark software stack, was initiated three years ago. This was when we decided to invest in our own software. It is a fully autonomous middleware platform, which was launched last year and has been licensed to one of the top five automakers globally. We are making rapid progress in enhancing the capabilities of Autonomai and making it more robust.

**Q: Do you plan to test Autonomai on Indian cars and public roads?**

**Shaju:** 'Autonomai' is the result of our work on driverless car solutions for the past few years. It is an intelligent, autonomous vehicle middleware platform, an AI-based solution. This

platform's sensor fusion algorithm combines inputs from Lidar and other sensors and leverages AI and deep learning to come up with various use-case scenarios of driverless cars. We have licensed this software to a leading global OEM and field trials are going on in Europe.

We have also deployed the same software stack along with camera and different sensors on Indian-made cars. The car is tested in a closed track with simulated road conditions within our premises.

Currently testing of features such as traffic jam assist (Stop & Go, Distance keep), On-road obstacle (Static/ Dynamic) avoidance (Safe stop and Lane change), etc are completed. The autonomous test vehicle speed is limited to 50kmph as per the traffic and road regulations for urban driving. Considering safety as the priority, for Indian cars and roads the features such as Traffic Jam Assist, Collision Avoidance, and Adaptive Cruise Control (ACC) are very crucial and once the necessary legal clearances are in place, we can test these features on open Indian roads.

**Q: What is your target market for this mobility service?**

**Shaju:** We are in constant touch with the global OEMs. They can readily deploy our Autonomai solution for their R&D programmes.

Today's cars are connected and smart machines on the move. There is also the V2X (vehicle to vehicle and vehicle to infrastructure), which makes driving more hassle-free, and autonomous. "Among the many challenges, the most prominent one is how to address the requirements for a new set of sensors and sensor configuration. Equally challenging is how fast we can test various driving scenarios

before we rightly say that the car is safe to drive autonomously. This also means that the software content inside the car will increase and is making the car vulnerable to potential hacking which can be life-threatening. Connected cars are generating staggering amount of data enabling data analytics, image processing, voice recognition etc to churn out meaningful and useful information

and OEMs have to ensure that the generated data is not getting into any wrong hands," he said.

"As EV is coming to mainstream, the range anxiety it creates is larger. People today need fast charging and sufficient range on one full charge. It needs to be seen how the car manufacturers will meet the growing urban demands on mobility efficiently," Shaju said. **ACI**