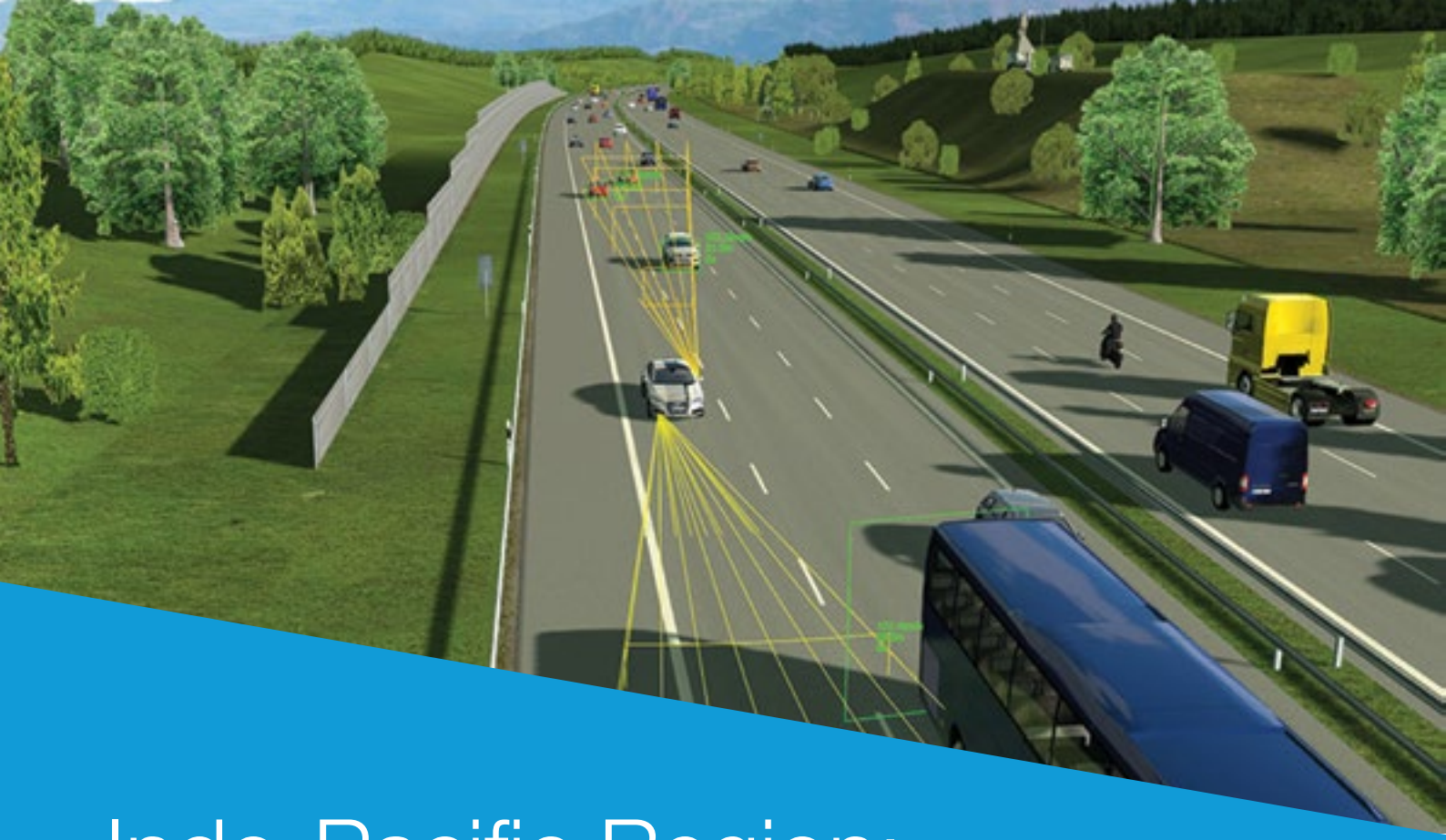

Indo-Pacific Region: **An Opportunity in the Making for Engineering R&D**

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Engineering simulation has evolved significantly over the last few decades. In product research and development (R&D) divisions today simulation is a 'must-have' rather than a 'nice-to-have', in contrast to a couple of decades ago. Historically, developed markets like the US, Europe and Japan have dominated spending within the engineering R&D sector. However, in the last eight to ten years the centre of decision-making in engineering R&D has gradually shifted towards the East in general. For MSC Software, this shift has led to an acceleration of investments within the Indo-Pacific region, consisting of India, ASEAN and ANZ.

Growing Region with Diversity

The Indo-Pacific region is emerging as one of the fastest growing in the world for the computer-aided engineering (CAE) industry, with significant potential for growth. Estimates by consulting bodies and industrial sources suggest that

the current purchasing power of the Indo-Pacific region is in the same range as the US, the EU and China, and is poised to overtake the US and the EU in the next decade. The Indo-Pacific region as a whole is projected to grow at 6.6 per cent (weighted projected growth) on a $6.3 trillion combined economy; in other words, increasing by a Malaysia or a Thailand every year.

Of course, the region is not homogenous and trends vary. For example, India is fast growing in automotive, Tier 1 and 2 suppliers and small and medium businesses (SMBs), while it also has a broad aerospace, defence and machinery market. In the ASEAN region, we have Thailand with its auto supplier companies, Malaysia focused on electronics and Singapore focused on advanced technology. In ANZ, mining and defence are picking up. In short, as you can see, we have a wide variety of growth markets driven by different industry mix, regulations, languages and cultures.

Trends

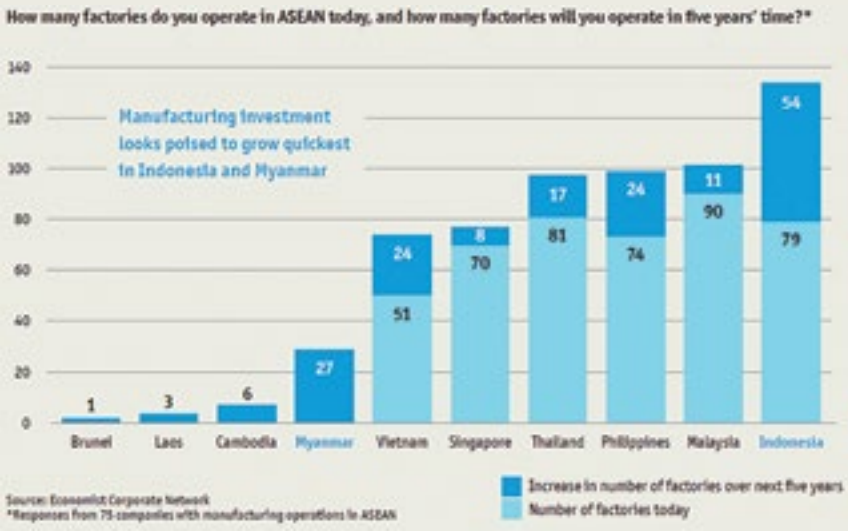
Talking about trends globally and relevant to the Indo-Pacific region, there are three that stand out: autonomous vehicles; additive manufacturing; and connected smart factories.

Autonomous Vehicles

It is an exciting time to be in the automotive/technology industry, as it is buzzing with innovation. There is considerable disruption happening in the automotive industry today with the rise of autonomous vehicles. Until now, auto manufacturers needed only to consider vehicle performance. For example, is it easy to handle, how good are the Noise, Vibration & Harshness (NVH) characteristics, are the parts long-lasting, and so on. Today, the situation is far more complicated. Not only do you have to worry about the car, you need to get inside the brain of the 'person' driving it.

In a driverless car, you need to anticipate the various scenarios that the vehicle will face and plan for how the car will behave in each situation. Moreover, there are innumerable scenarios that need to be simulated. We need to reproduce and duplicate the entire environment in which the car will operate and enable it to have the right responses in real time. Physically prototyping each scenario is just impossible. So, simulation is the answer.

The term 'autonomous' is relatively broad. There are five different levels of autonomy defined by the Society of Automotive Engineers (SAE). India may be ready for a certain degree of independence, but not for a completely autonomous driverless car, for now at least. For instance, the concept of active safety could take off in India and prove very useful in an urban traffic scenario. Given the complexities in India, simulating and designing for all situations is more challenging. However, the goal is to get there eventually. There might be specific scenarios, controlled environments and locations where driverless vehicles can be safely used, for example in airports to deliver people and goods to the aircraft. Apart from the automotive sector,



LightHinge+ example pictured

autonomous technologies can provide significant value in verticals such as agriculture, mining and similar industrial verticals to achieve higher productivity, visibility and safety.

At the same time, in other parts of the Indo-Pacific region such as Singapore and Australia, there are major government-driven initiatives to move aggressively into a complete autonomous mobility infrastructure, from the roads to signals to cars to pedestrians, linking short-distance travel to long-distance travel with the appropriate transportation modes.

Additive Manufacturing

The second exciting trend is around additive manufacturing. Until very recently, nobody would have imagined that additive manufacturing could be possible in a mass production environment. The subtraction manufacturing approach was deeply ingrained. For example, you take a steel block that you bore, cut and shape into the product that you need. 3D printing machines are turning this entire process on its head. With additive manufacturing, you can create complex parts that cannot be manufactured in a traditional environment. Additive manufacturing is giving greater freedom to designers while allowing the manufacture of complex shapes without joints, providing manifold opportunities.

Connected Smart Factories

Across markets, there is an appetite for new CAE technologies that integrate disciplines and stand-alone CAE tools into unified multidiscipline solvers and user environments. These 'next-generation' products enable engineers to improve the reliability and accuracy of their virtual prototypes by including multi-physics and multidiscipline interactions. So, that is a clear trend in the CAE space.

Beyond CAE and moving into manufacturing, Hexagon today has the Xalt platform that essentially fast-tracks our customers' ability to harness IoT data and extract its full potential and value. Xalt is a radical new approach to accelerating digital transformation for our customers. It can be deployed to gain efficiencies directly from quality, production, maintenance, supply chain and field services.

Hexagon's disruptive technologies like Xalt move our Customers beyond the data impasse of IoT by leveraging the vast potential of data being generated by connected things – integrating AI, Edge-Cloud Orchestration, Mobility, and Data Visualization into Autonomous Connected Ecosystems.

Nurturing CAE Talent in Indo-Pacific

In the last 20–25 years, the quality of engineers graduating from colleges in India and SE Asia is improving steadily. However, education and skill-building need a constant focus on the fast-changing research and business landscapes. The CAE industry has an important role to play in working with academic institutes to ensure that relevant technologies are part of the coursework and that students are preparing for industry's R&D needs through their application and skill-building. The steadily growing market coupled with the right skill-building efforts will ensure that the future looks bright for the CAE industry in the Indo-Pacific region.