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The Three Waves in the Evolution of the Engineering Services Outsourcing Industry

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INTRODUCTION

Engineering services outsourcing (ESO) has traditionally included services required at each stage of the product lifecycle, from conceptualization to retirement. Product design and development, which are core to the engineering function, have long leveraged Information Technology (IT) through tools and databases and through the automation of certain processes.

Today, engineers are integrating IT more tightly into the design of products so that technology envelopes and enables them. Instead of selling a kitchen appliance, for example, consumer durable manufacturers are selling appliances-as-a-service. The smart machine is engineered with built-in IT so that it connects to a smart platform for predicting, preventing and scheduling maintenance. And it is ESO providers that are taking the lead in the integration of engineering and IT in this new digital world.

At the present moment, we are in the second of three waves that mark the evolution of the ESO industry. While advancement in technology is really what drives change in this field, business and consumer expectations also push it forward. This white paper explores the evolution of the engineering services outsourcing market and what it means for enterprise growth. The table below outlines the characteristics and real-world examples that define each wave.

The Three Waves of the Engineering Services Industry (Figure 1)

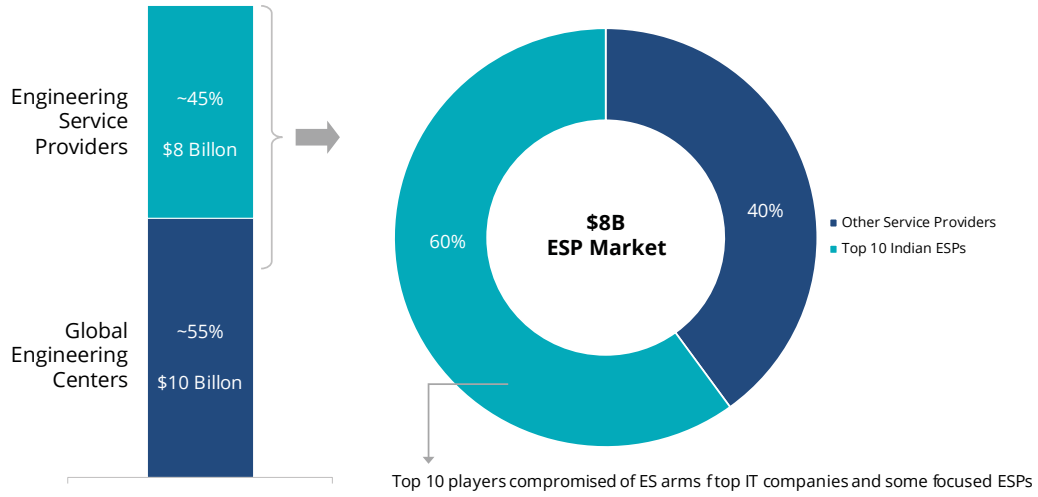
	Technology Shift	Industry Examples
Wave 1 2000-2010	Embedded software in the product and product ecosystem	1. Auto manufacturing – telematics and infotainment 2. Aerospace – advanced navigation and infotainment 3. Healthcare – medical devices and implants 4. Consumer electronics – embedded intelligence
Wave 2 2010-2017	Internet of Things, machine-to-machine (M2M) adoption and digital transformation; *IT envelopes the product*	1. Auto – Vehicle to vehicle (V2V), vehicle to infrastructure (V2I), driver assistance 2. Smart homes – connected home appliances 3. Healthcare – remote and continuous monitoring 4. Oil and gas – engineering information management
Wave 3 2015 onwards	Manufacturing integrates with engineering and IT systems; 3-D or additive printing *(IoT evolution)*	1. Auto – Smart manufacturing 2. Oil and gas – digital oil fields with integrated, optimized asset utilization 3. Cross-industry – manufacturing execution systems/ product lifecycle/enterprise resource planning integration to leverage social media, analytics and big data to drive product usage and design 4. Cross-industry – 3D and additive printing applications

WAVE 1: ENGINEERING SERVICES OF YESTERDAY

To date, many enterprises consider ESO an extension of their engineering organization. As a less mature industry than IT outsourcing (ITO) or business process outsourcing (BPO), the ESO market has remained relatively small with a core group of service providers based in centers in India, China and Eastern Europe. ESO engagements still generally use contracts delivered though time-and-materials (T&M) arrangements with short project durations lasting approximately 12 to 18 months.

According to data collected in 2014, India-based ESO providers account for nearly a quarter of the overall engineering services market, which is worth approximately US $80 billion annually. The National Association of Software and Services Companies (NASSCOM) predicts that the engineering services revenue base in India will grow from $18 billion in 2014 to $30-38 billon in 2020, with a compound annual growth rate (CAGR) of 12-13 percent, a growth rate greater than the overall IT-BPO industry. This growth and the evolution of new service delivery and pricing models in the near future are likely to break up the quasi-oligopoly enjoyed currently by a dozen-plus India-based service providers.

The Indian Engineering Services Industry in 2014 (Figure 2)



Source: NASSCOM, ISG Analysis

In 2014, the Indian ESO industry was made up of Global Engineering Centers (GECs) and engineering service providers (ESPs). As illustrated in Figure 2, the GECs generated about 55 percent of the total revenue of the Indian ESO industry and operated as extensions of engineering research and development (ER&D) arms of enterprise clients, many of which are global technology giants. Analysts in the field estimate that half of the top 500 research and development (R&D) spenders operate in India through these GECs.

A major portion of the remaining 45 percent of the industry revenue is generated by the two dozen or so ESO providers. This group consists of large or medium-sized Indian IT companies, medium or small-sized ES-focused Indian firms (many of which are backed by private equity) and offshore delivery centers of global IT companies.

WAVE 2: THE INTERNET OF EVERYTHING DISRUPTS ENGINEERING SERVICES DELIVERY

Recent advances in sensor technology, wireless communications, distributed computing and big-data capabilities currently are enabling the Internet of Things (IoT) to rapidly transform the technology landscape. IT and electronics are permeating the product engineering process, and consumers' expectations and requirements are increasing. Three trends are driving this change:

1. Embedded electronics is adding intelligence to products so they require connection to databases and connected platforms.
2. Internet enablement in products and services requires a direct interface between IT and engineering.
3. IT-enabled and engineered products are intersecting with manufacturing constructs like 3D printing.

As IT permeates products and services, firms across industries must deal with a profusion of data and devices. This new challenge is creating unique opportunities for ESO providers to create intelligent engineering applications to customize and monitor the entire product experience, whether in the oil and gas field, healthcare or another industry.

How IoT is Applied across Industries (Figure 3)

	Key IoT Applications across Industries
Automotive	Connected car, advanced driver assistance, Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication
Energy/Utility	Smart grid, smart buildings/energy consumption, proactive maintenance of critical and expensive production equipment
Healthcare	Remote monitoring, real-time and continuous clinical care, wearable devices, early intervention
Consumer Electronics	Smart homes/home automation, intelligent devices like washing machines and refrigerators enabling energy management, remote access and security

Across industries, software is the key to the acquisition, retention and satisfaction of end-users. As software becomes the new medium for increasing the number and improving the usability of products and services, every company must become a software company. To increase agility in product development and reduce development cycles, engineers and designers are creating products to capture their own usage data and establish a continuous feedback loop. This way they can make their products more intelligent, and original equipment manufacturers can increasingly deliver their products as-a-service and use software applications to define the customer experience. These trends have spawned a huge demand for software engineering around newer and more engaging digital applications and have brought about the new convergence of IT and engineering.

WAVE 3: THE INTEGRATION OF IT, ENGINEERING AND MANUFACTURING WILL BE THE NEXT BIG THING

The third wave of the ESO industry will be characterized by the integration of manufacturing as a third field of expertise. As the industrial internet becomes more secure, industrial automation, robotics and 3D printing are enabling a new dynamic which will create a more pronounced change than that of the prior two waves of evolution. Initiatives such as Industry 4.0 in Europe and the Industrial Internet in North America are enabling the creation of the 'digital shop floor.'

The third wave will happen in two phases:

Phase 1: The evolution of the digital shop floor will integrate previously siloed information across an enterprise with systems like Enterprise Resource Planning (ERP), Product Lifecycle Management (PLM), and Manufacturing Execution Systems (MES). Such integration will increase productivity, optimize operational costs, enhance equipment utility, improve safety for employees and lessen environmental implications. ESO providers equipped with the right tools, skills, and key partnerships will play an important role in developing the digital shop floor.

Phase 2: Fabless manufacturing, the outsourcing of the fabrication of discrete hardware devices, will be based on the disruptive concepts of additive manufacturing and 3D manufacturing. As 3D printing becomes more widely applied, there will be immense opportunity to leverage it for economic growth. The design-to-print concept will impact product maintenance and repair requirements and dramatically cut manufacturing costs and time.

Imagine a washing machine that can suggest the replacement of a spare part through a smart platform. The communication sent to the local provider triggers the printing of a spare part in a fraction of the time and cost required to otherwise source it from a remote warehouse. Or consider 24x7 monitoring of the production of critical and expensive infrastructure equipment in which a predictive maintenance system generates a request to trigger a real-

time 3D-printed replacement. The 3D printing concept is more operational than most people believe, largely powering the hearing-aid industry today.

THE CHANGING FACE OF ENGINEERING SERVICES

To realize the full potential of these growth opportunities, the ESO delivery model must change. Current GECs that are entirely focused on engineering products must address the challenges of IT-enabled engineering by broadening their scope and enhancing their investments in new processes and technology. They will be forced to create integrated service models that add measurable value and innovation to the parent enterprise. GECs must also leverage the higher level of experience, exposure and investments of ESO providers in a collaborative model.

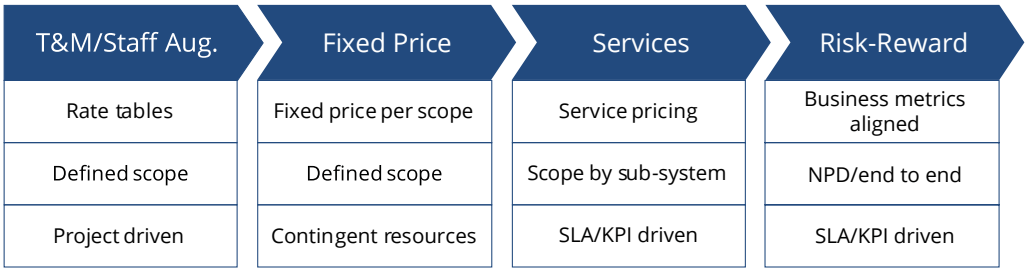
Over the course of the next five years, we will see significant changes in the services engagement models, as illustrated in Figure 4 below.

The Evolution of Engineering Services Outsourcing (Figure 4)

	2015	2020
Delivery Model	Offshore = 80% Onsite = 20%	Offshore = 60% Onsite/nearshore = 40%
Business Model	T&M and staff augmentation = 70% Fixed/outcome-based/others = 30%	T&M/staff augmentation = 50% Fixed/outcome-based/risk-reward = 50%
Key Drivers	1. Cost 2. Scale 3. Skills	1. Operational excellence 2. Contractual Innovation

To facilitate the change, managed services contracts for ESO providers will need to move away from the traditional engagement models to demand more value and tighter service integration. This will include changes as seen in Figure 5 below such as pricing aligned to client business metrics, stringent service-level agreements and key performance indicators. The business model will slowly shift toward greater sharing of risk and reward between the client and the service provider so that the provider will become a more strategic engineering partner rather than a mere supplier of engineering services.

The Implication of these Changes on ESO Service Models and Pricing
(Figure 5)



As the delivery of ESO evolves, the value of GECs will increase and contribute to an integrated service delivery model, a more trusting and nurturing relationship with key service providers and an improved value proposition for the enterprise. Future ESO service providers will need to put more skin in the game and establish service delivery models that incorporate much larger engagement portfolios and a governance framework that enables innovation and accelerates both top-line and bottom-line growth for the enterprise.

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Sampath and his team help enterprises leverage engineering services to address the needs of IT in engineering and accelerate time to market for product development teams. Sampath has more than 30 years of experience in engineering services and software product development and management. Prior to ISG, Sampath led the engineering services of Tata Consultancy Services in North America where he provided innovative solutions in Product Lifecycle Management, Embedded Software Development, Product Engineering and Plant Solutions for multiple Fortune 500 companies. He also led the Aerospace and Process Manufacturing business units and drove key business initiatives for engineering and manufacturing customers that included marquee Fortune 100 clients. Before joining TCS, Sampath led the Infosys Automotive business units in North America and Europe.

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