ISG Provider Lens™

Manufacturing Industry Services

U.S. 2021

Quadrant Report

A research report comparing provider strengths, challenges and competitive differentiators

December 2021

Customized report courtesy of:

Capgemini

About this Report

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The research and analysis presented in this report includes research from the ISG Provider Lens™ program, ongoing ISG Research programs, interviews with ISG advisors, briefings with services providers and analysis of publicly available market information from multiple sources. The data collected for this report represents information that ISG believes to be current as of Nov 2021, for providers who actively participated as well as for providers who did not. ISG recognizes that many mergers and acquisitions have taken place since that time, but those changes are not reflected in this report.

All revenue references are in U.S. dollars ($US) unless noted.

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ISG Provider Lens™

ISG Provider Lens™

ISG Provider Lens™ delivers leading-edge and actionable research studies, reports and consulting services focused on technology and service providers' strengths and weaknesses and how they are positioned relative to their peers in the market. These reports provide influential insights accessed by our large pool of advisors who are actively advising outsourcing deals as well as large numbers of ISG enterprise clients who are potential outsourcers.

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EXECUTIVE SUMMARY

Digital Engineering – Transportation

In the U.S., on-highway transportation is facing a significant technology evolution in terms of electrification (sustainability), autonomy, connectivity and security. Some of these technologies, such as autonomy and connectivity, will have areas of overlap and can interface with other road systems. At the same time, manufacturers are facing the challenge of delivering the zero-emission paraphernalia for vehicles.

ISG has observed some key trends in this space, as listed below.

Vehicles reimagined as "smartphones on wheels" and "data centers on wheels:" These concepts are gradually gaining pace and opening up several new markets for stakeholders. The software-defined vehicle is all set to change the automotive software development paradigm, offering a B2B components market of approximately $8 billion according to one industry source. Furthermore, several original equipment manufacturers (OEMs) are trying to progress directly to the L4 autonomy from L2, targeting specific use cases such as autonomous valet parking.

Leveraging the scalability of cloud to fluidize vehicle operations: As the intelligence of automotive architecture moves down to the end point, system integrators are replicating the cloud compute model and extending that model to the intelligent edge. In addition, electronic control units (ECUs) such as cockpits, advanced driver assistance systems (ADAS), telematics, engine control and body control are being consolidated into digital computer units (DCUs). Thus, evolving the automotive architecture to meet these types of models has become a requirement while keeping in mind the release of new vehicle models every year. Lastly, the industry is witnessing an overall consolidation such as the inception of Stellantis as the result of the merger of PSA and FCA.

Digital Engineering – Hi-Tech

The consolidation of this market has benefited outsourcing and offshoring companies. Major service providers often work with most of the top semiconductor companies. Thus, when two companies get merged (such as Cypress and Infineon, Intel and Altera, AMD and Xilinx, Nvidia and Arm) or engage in deeper partnerships, the longstanding outsourcing partner becomes the most preferred R&D partner. Accordingly, enterprises are directing critical functions such as the new design derivatives to R&D partners, and service providers take over the derivatives for such companies.

Some of the key trends realized by ISG in this space are presented below.

Driving cost effectiveness through economies of scale: Tech titans such as Facebook, Apple, Google and Microsoft are designing their own chips and are consistently creating significant infrastructure to drive basic application specific integrated circuit (ASIC) design capabilities. The cost associated with the usual custom ASIC design, which ranges from $200 million to $300 million based on the size and complexity, can be amortized over a period with economy of scale. Furthermore, this organic approach limits the exposure of their intellectual property to competitors, making them in charge of their own growth trajectory and competitive positioning. This dynamic is driven by the accessibility of talent and the ability of providers that offer turnkey services. ISG expects this growth momentum to accelerate with the growing enterprise demand for ASICs. Many are considering end-to-end backward integration from their own design and fab agreements to ensure that supply is not thwarted by industry-level disruptions. This is relevant from the recent M&A activities such as the acquisition of Barefoot Networks by Intel and Annapurna Labs by Amazon.

Shift in business models for chip manufacturers to create a recurring revenue model: ISG expects that chip manufacturers will move up the stack and offer more software-enabled products and services over the years. Instead of just offering the chip, they will provide platform as a service. This will create a recurring revenue model from software on a subscription or consumption basis, deflecting from a one-time revenue model. Accordingly, companies would provide a platform that will enable customers to build applications and monetize them.

As outsourcing and offshoring picked up scale in the semiconductor vertical, technical aspects such as design and architecture became less relevant. This is because several service providers and system integrators were focused on delivering scale for chip manufacturers through functions such as verification and validation and were often diverging from core technology areas in the pre-silicon domain such as very large-scale integration (VLSI). These attributes become critical as the markets for autonomous vehicles, ADAS components and other niche technologies mature and demand more capabilities in AI and robotics.

Digital Engineering – Industrial

The industrial and off-highway vehicle and equipment market is asset-intensive and capital project based. B2B activities in this space include fleet operations, rentals and leased equipment for agriculture, mining and construction. Because off-highway OEMs and tier 1s are digitally less mature than automotive and transportation industry participants, service providers have been engaged in building the digital thread foundation for these customers.

Here are some of the key trends that ISG has observed in this space.

Requirement for optimizing manufacturing output: While the volume in the industrial vehicle and equipment space is not as high compared to automotive, manufacturers have to optimize their output. As a result, significant manufacturing shop floor integration is taking place across agriculture, construction and heavy vehicle segments. The industry has

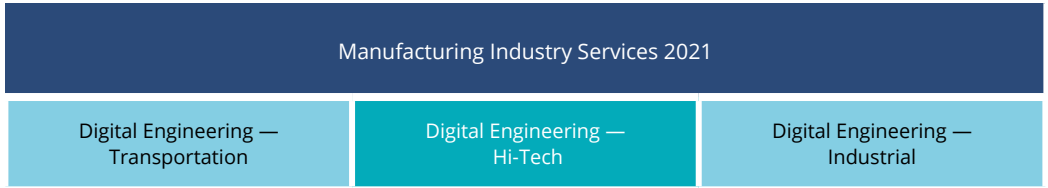
witnessed considerable layers of automation being integrated on the manufacturing side for automotive market participants, and this trend is gradually extending towards the off-highway vehicle segment. Concurrently, market participants are considering implementing full-scale automation across the assembly line and supply chain functionalities, including warehouse and lineside supply.

Drift towards intelligent product architecture in a phased approach: Off-highway transportation OEMs and tier 1s have been trying to move away from pureplay mechanical products to smart products. Some market participants are also considering shifting to intelligent product architecture to simplify operations in farming and mining.

The off-highway industry has indicated ambitious plans of driving sustainability through recycling, reusing and remanufacturing. Several system integrators have been exploring possibilities with AI-powered solutions for repurposing and remanufacturing activities and thus drive the overall asset efficiency for customers.

Introduction

Simplified illustration



Source: ISG 2021

Definition

The ISG Provider Lens™ Manufacturing Industry Services 2021 study tracks and analyzes the offerings around several elements of manufacturing, covering intricacies from product engineering such as design, development, pilot scale and industry scale production to shop floor manufacturing and remote product operations. Spanning the entire lifecycle of a product, from whiteboarding and 3D simulation to shop floor robotics, the report analyzes the major disruptions taking place in the industry.

Automation plays a significant role, spreading across components such as manufacturing operations management (MOM) and manufacturing execution systems (MES), and capturing process data and storing it in the cloud or inside the new edge. Service providers have been working extensively on shop floor transformation and integrated product

Definition (cont.)

development. They are bringing together electrical, electronic, mechanical, embedded and software components with conventional mechanical, electronics and electrical engineering. This has resulted in a combination of MES and product lifecycle management (PLM) solutions with cutting-edge machine-to-machine (M2M) connectivity and AI-driven insights. The solutions use insights to drive the underlying product and manufacturing engineering for the IoT stratagem.

The study examines the role of service and solution providers across the entire manufacturing industry value chain. It covers product engineering, design capabilities and pilot-scale implementations, virtual layout or simulation of the shop floor, ergonomics for machinery, IT and operational technology convergence, and aftermarket services. It also analyzes the capabilities of providers around aftersales support such as leveraging digital twins to check the condition of machinery as it reaches the wear-out period. In the three quadrants of this study — digital engineering capabilities for the transportation, hi-tech and industrial segments — ISG considers the providers' ability to automate shop floor functions across the entire ecosystem of digital manufacturing, from the implementation of MES, MOM, PLM and supply chain systems to product development and launch. Analysis of the business in terms of new-age technologies such as remote monitoring of the production line (which necessitates moving workloads to cloud) and providing momentum to IoT, cloud, augmented reality (AR), virtual reality (VR) and similar other technologies are focus areas. Overall, the quadrants analyze the attributes of providers for empowering organizations to transform a client into a digital enterprise and accelerate digital strategy implementations. ISG also analyzes the providers' ability to implement predictive maintenance activities. This includes scheduling diagnosis and roadmaps around capabilities in technologies such as 3D printing, augmented reality, virtual reality and other use cases of virtualization in several business landscapes. The ability to integrate security in every layer of product and manufacturing engineering with in-house capabilities or partnerships is assessed.

Scope of the Report

ISG sets out to deliver a comprehensive research program with clear and extensive evaluation criteria, covering the developments and deliverables of service providers and solution suppliers in this dynamic market. This study accounts for changing market requirements and provides a consistent market overview for the segments, along with concrete decision-making support to help user organizations evaluate and assess the offerings and performance of providers.

The ISG Provider Lens™ study offers IT, engineering, manufacturing, procurement and CDOs as well as R&D decision makers the following:

- Transparency on the strengths and weaknesses of relevant services and solution providers
- Differentiated positioning of providers by segments
- Perspective on several markets, including global, the U.S. and Europe

Our study serves as an important decision-making basis for positioning, key relationship and go-to-market considerations. ISG advisors and enterprise clients also use information from these reports to evaluate their current vendor relationships and potential engagements.

Provider Classifications

The provider position reflects the suitability of IT providers for a defined market segment (quadrant). Without further additions, the position always applies to all company sizes classes and industries. In case the IT service requirements from enterprise customers differ and the spectrum of IT providers operating in the local market is sufficiently wide, a further differentiation of the IT providers by performance is made according to the target group for products and services. In doing so, ISG either considers the industry requirements or the number of employees, as well as the corporate structures of customers and positions IT providers according to their focus area. As a result, ISG differentiates them, if necessary, into two client target groups that are defined as follows:

- **Midmarket**: Companies with 100 to 4,999 employees or revenues between US$20 million and US$999 million with central headquarters in the respective country, usually privately owned.
- **Large Accounts**: Multinational companies with 5,000 or more employees or revenue above US$1 billion, with activities worldwide and globally distributed decision-making structures.

Provider Classifications

The ISG Provider Lens™ quadrants are created using an evaluation matrix containing four segments (Leader, Product & Market Challenger and Contender), and the providers are positioned accordingly.

Leader

Leaders have a comprehensive product and service offering, a strong market presence and established competitive position. The product portfolios and competitive strategies of Leaders are strongly positioned to win business in the markets covered by the study. The Leaders also represent innovative strength and competitive stability.

Product Challenger

Product Challengers offer a product and service portfolio that reflect excellent service and technology stacks. These providers and vendors deliver an unmatched broad and deep range of capabilities. They show evidence of investing to enhance their market presence and competitive strengths.

Market Challenger

Market Challengers have a strong presence in the market and offer a significant edge over other vendors and providers based on competitive strength. Often, Market Challengers are the established and well-known vendors in the regions or vertical markets covered in the study.

Contender

Contenders offer services and products meeting the evaluation criteria that qualifies them to be included in the IPL quadrant. These promising service providers or vendors show evidence of rapidly investing in both products and services and a sensible market approach with a goal of becoming a Product or Market Challenger within 12 to 18 months.

Provider Classifications (cont.)

Each ISG Provider Lens™ quadrant may include a service provider(s) which ISG believes has strong potential to move into the Leader quadrant. This type of provider can be classified as a Rising Star. Number of providers in each quadrant: ISG rates and positions the most relevant providers according to the scope of the report for each quadrant and limits the maximum of providers per quadrant to 25 (exceptions are possible).

Rising Star

Rising Stars have promising portfolios or the market experience to become a Leader, including the required roadmap and adequate focus on key market trends and customer requirements. Rising Stars also have excellent management and understanding of the local market in the studied region. These vendors and service providers give evidence of significant progress toward their goals in the last 12 months. ISG expects Rising Stars to reach the Leader quadrant within the next 12 to 24 months if they continue their delivery of above-average market impact and strength of innovation.

Not In

The service provider or vendor was not included in this quadrant. Among the possible reasons for this designation: ISG could not obtain enough information to position the company; the company does not provide the relevant service or solution as defined for each quadrant of a study; or the company did not meet the eligibility criteria for the study quadrant. Omission from the quadrant does not imply that the service provider or vendor does not offer or plan to offer this service or solution.

Manufacturing Industry Services - Quadrant Provider Listing 1 of 3

	Digital Engineering – Transportation	Digital Engineering – Hi-Tech	Digital Engineering - Industrial
AKKA	Product Challenger	Not In	Product Challenger
Alten	Product Challenger	Not In	Not In
ALTEN Calsoft Labs	Not In	Product Challenger	Not In
Atos	Market Challenger	Not In	Not In
Axiscades	Contender	Contender	Contender
Bertrandt	Product Challenger	Not In	Product Challenger
Capgemini	Leader	Leader	Leader
Caresoft Global	Rising Star	Not In	Rising Star
Cognizant	Leader	Not In	Not In
Cyient	Product Challenger	Product Challenger	Leader
Dextra Technologies	Not In	Contender	Not In
DXC	Leader	Not In	Not In
eInfochips	Not In	Leader	Not in

Manufacturing Industry Services - Quadrant Provider Listing 2 of 3

	Digital Engineering – Transportation	Digital Engineering – Hi-Tech	Digital Engineering - Industrial
Expleo	Product Challenger	Not In	Product Challenger
GS Engineering	Not In	Not In	Contender
Happiest Minds	Contender	Product Challenger	Not In
HCL	Leader	Leader	Leader
Hitachi (GlobalLogic)	Product Challenger	Product Challenger	Not In
IBM	Not In	Market Challenger	Not In
Ignitarium	Not In	Rising Star	Not in
Infosys	Leader	Product Challenger	Leader
KPIT	Product Challenger	Not In	Not In
KPIT (Pathpartner)	Not In	Product Challenger	Not In
LTTS	Leader	Leader	Leader
Mindteck	Not In	Contender	Not In
Mindtree	Market Challenger	Not In	Not In

Manufacturing Industry Services - Quadrant Provider Listing 3 of 3

	Digital Engineering – Transportation	Digital Engineering – Hi-Tech	Digital Engineering - Industrial
Mphasis	Not In	Product Challenger	Not In
Neilsoft	Not In	Not In	Contender
QuEST Global	Product Challenger	Product Challenger	Not In
R Systems	Not In	Market Challenger	Not In
Sasken	Not In	Product Challenger	Market Challenger
TATA Elxsi	Product Challenger	Product Challenger	Product Challenger
TCS	Leader	Leader	Not In
Tech Mahindra	Leader	Leader	Product Challenger
UST	Product Challenger	Leader	Not In
VVDN Technologies	Not In	Contender	Not In
Wipro	Leader	Leader	Leader
Zensar	Contender	Not In	Not In

Manufacturing Industry Services Quadrants

ENTERPRISE CONTEXT

Digital Engineering — Transportation, U.S.

This report is relevant to enterprises in the transportation industry in the U.S. for evaluating providers of digital engineering services.

In this quadrant report, ISG highlights the current market positioning of digital engineering service providers to enterprises in the U.S. and how each provider addresses the key challenges faced in the region.

Enterprises in the U.S. have been pivoting to service providers that cover the entire value chain of engineering and R&D (ERD) services, which range from design to market operations. This spans functions from production to corporate services, including all the layers of advisory and consulting services as well as managed services. Instead of considering only the cost competitiveness, enterprises are turning toward service providers that tend to look at the evolution of the vehicle, from being hardware-defined to being software- and embedded systems-defined. While investing extensively in the connected and autonomous space, several enterprises are also looking at delivering mobility services.

Compared with other regions and countries, enterprises in the U.S. tend to partner with service providers and system integrators that address industry requirements from an ecosystem perspective. In case of engineering and R&D services for the automotive segment, the service providers need to bring the value propositions of the travel and the high-tech businesses together to drive the transformation of the customer and grow in the market.

Lastly, some digital engineering service providers in the transportation industry in the U.S. also offer software testing and validation services. Enterprises are seeking partners that can undertake turnkey engagements, addressing the challenges affecting the industry, and provide a roadmap for setting up an optimal engineering infrastructure.

Engineering and R&D leaders should read this report to understand the relative positioning and capabilities of providers to help them effectively plan and select product engineering and manufacturing-related services and solutions. The report also shows how the technical and integration capabilities of a service provider compare with the rest in the market.

Digital transformation professionals should read this report to understand how providers of digital engineering services fit their digital transformation initiatives (especially in the manufacturing spectrum) and how they compare with one another.

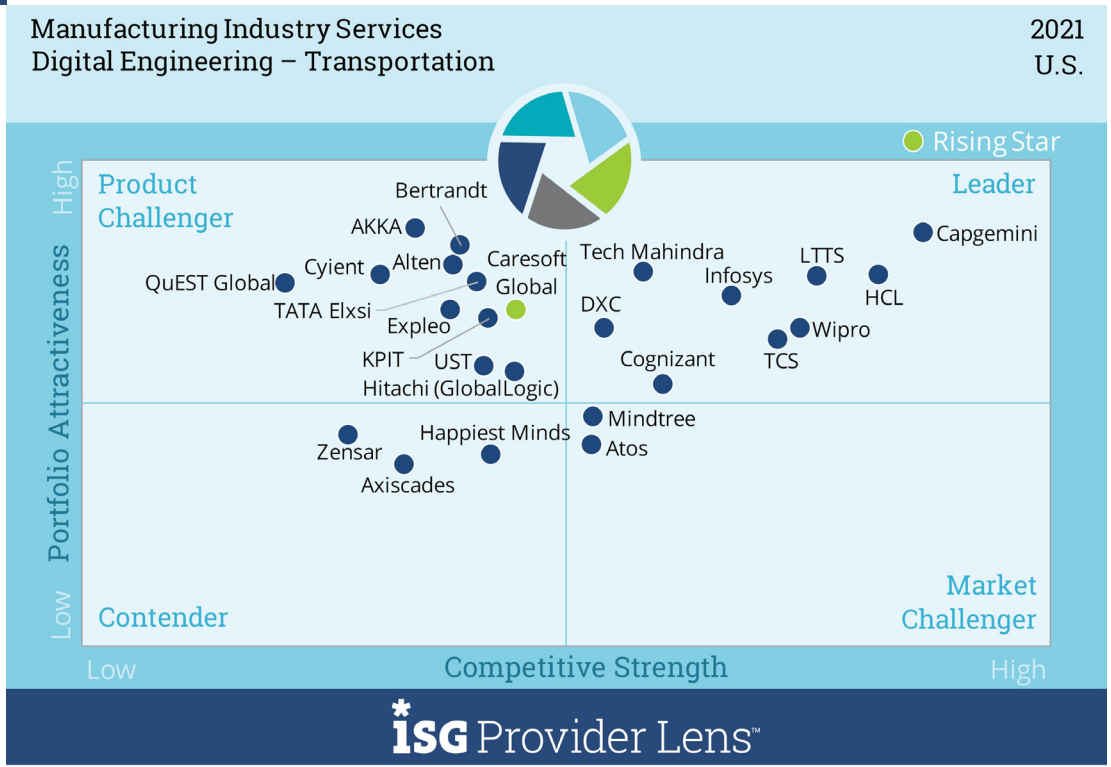
Manufacturing professionals should read this report to develop a better understanding of the current landscape of manufacturing engineering service providers in the U.S.

IT and OT security leaders should read this report to see how service providers address the significant challenges of compliance and security while keeping the manufacturing operations seamless.

DIGITAL ENGINEERING – TRANSPORTATION

Definition

The quadrant assesses the capabilities of engineering and R&D service providers and system integrators in systems engineering, including hardware (electrical and mechanical), software and embedded systems as well as segments such as small series manufacturing, tests and simulations. The digital engineering process starts from the design, development and pilot-scale implementation phase to every aspect of industry scale manufacturing engineering, including niche techniques such as additive manufacturing for passenger/commercial vehicles and two wheelers. Considerable focus is on the seamless integration of electronics, sensor technology and software systems to drive the concept of autonomous, connected, electric and secured (ACES), aligned with proficiencies in hydrogen propulsion concepts, virtual manufacturing, digital manufacturing and lean manufacturing. Lastly, ISG analyzes domain expertise across the latest testing methodologies such as noise-vibration-harshness (NVH), virtual vehicle and brake systems, as well as opportunities in the growing market of test equipment design and testing-as-a-service, vehicle security and OT security among others.



Source: ISG Research 2021

DIGITAL ENGINEERING — TRANSPORTATION

Eligibility Criteria

- Ability to execute at least one smart manufacturing process (that may or may not be a usable end product for passenger and commercial vehicles or a motorcycle) that meets OEM requirements
- Demonstrate development capabilities in at least one automotive segment, namely body, engine, transmission, suspension, braking systems, powertrain or interiors
- Exhibit capabilities in advanced technologies such as nanotechnology for the manufacture of lightweight vehicles, fuel cell or hydrogen-powered propulsions to reduce emissions, and new battery chemistries to increase electric vehicle (EV) sustainability
- Specialize in at least one aspect of the automotive manufacturing process such as chassis production, electrocoating, surface finishing, pre-assembly or final assembly
- Demonstrate product development and obsolescence management capabilities

Observations

Among the 26 participants in this quadrant, nine were identified as Leaders and one as a Rising Star. Key observations about the Leaders and the Rising Star are below.

- **Capgemini** aims to leverage the cloud compute model and extend it to the intelligent edge, i.e., the vehicle, as the software-defined vehicle architecture gains traction.
- **Cognizant** is suitably positioned in the transportation segment as the industry explores possibilities with technologies that enhance safety, navigation, infotainment, payments, voice recognition features, and autonomous driving capabilities.
- **DXC** Robotic Drive, the company's flagship offering in the autonomous driving space, orchestrates the end-to-end development process. This includes data collection, storage, analysis and realization of the evolved knowledge in the end product.
- **HCL** provides extensive services in manufacturing automation, robotics and Industry 4.0, which are the need of the hour as the automotive industry moves towards recovery.
- **Infosys** helps clients move up the business value chain, while fluidizing their core value chain planning, engineering and design and extending support for aftersales and customer services.

DIGITAL ENGINEERING — TRANSPORTATION

Observations (cont.)

- **LTTS** has capabilities across both product and manufacturing engineering services, allowing the company to translate its product development expertise to manufacturing excellence for clients.
- **TCS's** consultative approach across the evolving technology paradigm spans ADAS, connected cars, autonomous cars, telematics, fleet management, early warning analytics and connected infotainment. This enables OEMs to attain the appropriate solution for their requirements.
- **Tech Mahindra (TechM)** has been leveraging various opportunities in the automotive market as vehicles become software-defined and software ownership passes on to tier 1s and OEMs, leading to more ECUs getting pooled in DCUs. In addition, applications are increasingly handling more computation, with ECUs and DCUs necessitating hardening.
- **Wipro**, being a tier 1 software supplier, brings in new feature sets after delivering software to the factory. The company also takes the product through the entire certification cycle prior to the launch by the OEM.
- **Caresoft Global** (Rising Star) has a strong focus on digital twins and upgrading them to virtual reality for the last few years. This is expected to influence its cost reduction proposition.

CAPGEMINI

Overview

Capgemini, based in Paris, has rebadged its combined engineering and R&D (ERD) services segment as Capgemini Engineering after the acquisition of another French entity, Altran. The company has a significant presence in the U.S.

Strengths

Effective top-down approach from strategic use cases to identifying supporting data: Capgemini has been engaging with OEMs to create data-driven models to deliver a personal experience in the context of the end user's location. Its value proposition is to deliver a suitable car-to-cloud platform that can identify relevant information sources to acquire the right data (from the vehicle's sensors and other personal accounts) to build a predictive model. Its predictive analytics helps ease vehicle maintenance and can be used for predictive scheduling of stops during navigation. Thus, from a high-level vision of use cases, Capgemini drills down to a pragmatic view of the necessary data to deliver a roadmap with a scalable platform.

Delivering data-driven integrity to accelerate the hydrogen economy: Capgemini has been one of the first movers in offering services associated with the hydrogen economy. The company has showcased a client success story around hydrogen fuel-powered buses, where field data from existing fleets were used as input for predictive models. Given the existing challenge of high failure rates of fuel cells, the data-driven models can help identify points of failure for the buses to ensure that specific cells are swapped out in maintenance centers. This data can also be used for designing future versions of fuel cells that are more robust. The company effectually monitors all elements in the fuel cell, such as recirculation blowers and deionization filters, to enhance precision of the model and thus reduce the total cost of ownership.

Caution

With the increased integration of software components, the automotive engineering and R&D services market has created opportunities for several new players that do not have mechanical, electrical or embedded systems capabilities. This has made the competitive landscape much more intense.

2021 ISG Provider Lens™ Leader

Capgemini has been helping clients intersect their business strategy with the car-to-cloud strategy, allowing them to identify the most appropriate use cases.

ENTERPRISE CONTEXT

Digital Engineering – High Tech, U.S.

This report is relevant to enterprises in the high tech segment in the U.S. for evaluating providers of digital engineering services.

In this quadrant report, ISG highlights the current market positioning of digital engineering service providers to enterprises in the U.S., and how each provider addresses the key challenges faced in the region.

Semiconductor manufacturers are redefining their processes, as production complexity and costs increase. With the rapid development of protocols such as PCIe, DDRLP, NVMe, CXL for data centers, it is difficult for semiconductor manufacturers to verify IP every time. Also, the engagements over hybrid storage IPs are gaining traction. To reduce program time, semiconductor manufacturers, therefore, need ready-made verification IP to speed up verification cycles. The demand for verification IPs and design IPs and their seamless integration has increased with the advent of electronic design automation (EDA) tool vendors in the semiconductor ecosystem. As a result, the demand for reusable framework structures to scale the design and verification environment and accelerate the automation of verification processes is increasing.

In addition, digitization is changing the value chain. Semiconductor manufacturers have started to outsource derivative designs to meet the demand from various sectors. Accordingly, both foundries and silicon design houses are focusing on bringing rapid derivatives to the market for their core semiconductor offerings. This requires changes to the algorithm block to integrate different components into the final product more quickly.

Engineering and R&D leaders should read this report to understand the relative positioning and capabilities of providers to help them effectively plan and select product engineering and manufacturing-related services and solutions. The report also shows how the technical and integration capabilities of a service provider compare with the rest in the market.

Digital transformation professionals should read this report to understand how providers of digital engineering services fit their digital transformation initiatives (especially in the manufacturing spectrum) and how they compare with one another.

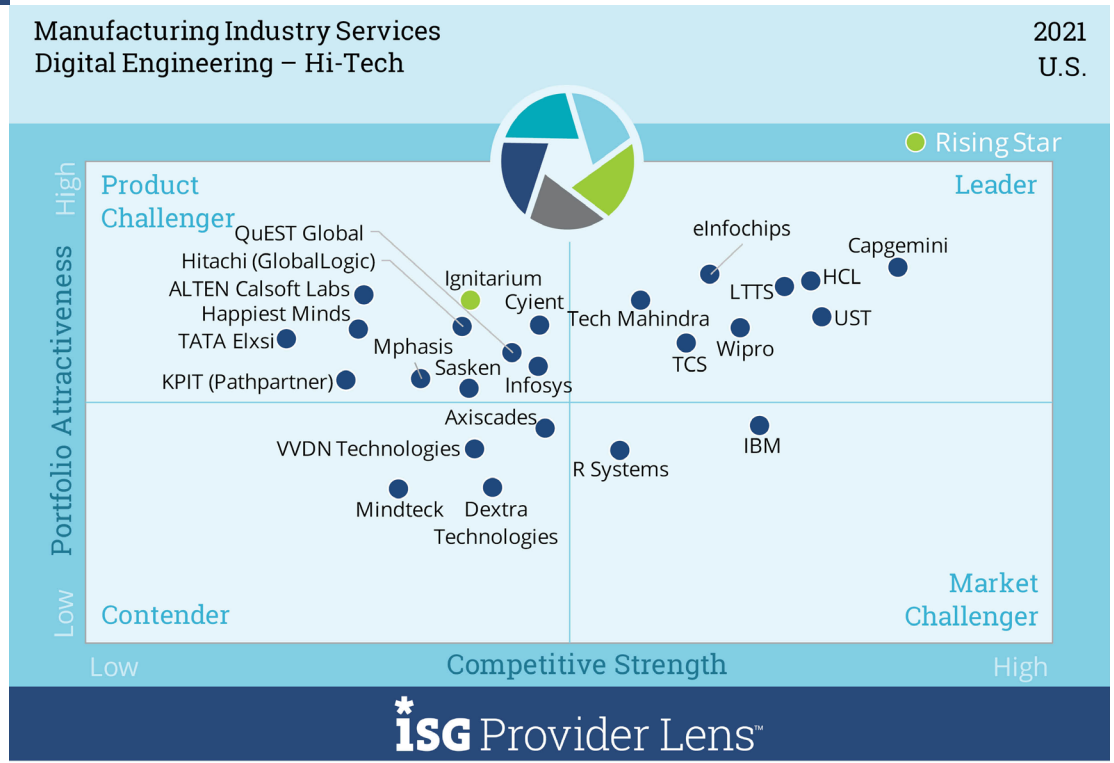
Manufacturing professionals should read this report to develop a better understanding of the current landscape of manufacturing engineering service providers in the U.S.

IT and OT security leaders should read this report to see how service providers address the significant challenges of compliance and security while keeping the manufacturing operations seamless.

DIGITAL ENGINEERING – HI-TECH

Definition

The quadrant analyzes the engineering and R&D capabilities of service providers in the mainstream semiconductor manufacturing processes and across front-end-of-the-line (FEOL) and backend-of-the-line (BEOL) subprocesses — from creation of transistors to the formation of interconnects within a device. ISG analyzes the provider's potential to bring software-defined product differentiation based on the foundational semiconductor engineering capability. It also examines the ability to deliver disruptive use cases, such as AI-enabled chips and high-speed networks, and to enable businesses to unlock the power of cloud through collaborations with hyperscalers. A provider's expertise is measured based on its design engineering prowess and quality assurance capabilities. Some of the major functions include ensuring compatibility in interconnects, the small wiring schemes in devices which contribute to the resistance-capacitance (RC) delay in semiconductor chips. A service provider is expected to have design capabilities in key subsegments, including digital, analog, high-speed physical interface intellectual property, embedded memory compiler, electronic design automation (EDA) and modeling.



Source: ISG Research 2021

DIGITAL ENGINEERING — HI-TECH

Eligibility Criteria

- Demonstrate design and/or quality assurance capabilities in the complementary metal oxide semiconductor (CMOS) manufacturing processes, which may or may not be a usable end product for an electronic device vendor to meet an enterprise requirement
- Services to encompass one or more of the FEOL processes (wafer preparation, isolation, well formation, gate patterning, spacer, extension and source/drain implantation, silicide formation and dual stress liner formation) and BEOL processes (dielectric film deposition, patterning, metal fill and planarization by chemical mechanical polishing)
- Demonstrate proficiency in integrated circuit (IC) manufacturing or IC fabrication, including materials, processes, integration and lithography engineering, with in-house talent or by engaging contract manufacturers
- Demonstrate capabilities or have plans to help manufacturers acquire certifications such as ISO 9001 and ISO 14001
- Specialize in at least one manufacturing process such as wafer preparation, photolithography, etching, cleaning, thin films, ion implantation, planarization, test and assembly
- Demonstrate experience with advanced technologies such as new materials (high-K/metal gate, or HKMG, and III-V materials or non-copper BEOL metals), new interconnect structures (FinFET/Trigate, nanowires, self-aligned via integration or Cu/air-gap interconnects), new integrations (3D IC, through-silicon via, or TSV, or 3D heterogeneous integration), and new lithography technologies [(double patterning, extreme ultraviolet, or EUV, lithography and directed self-assembly (DSA)]

DIGITAL ENGINEERING — HI-TECH

Observations

Among the 25 participants in this quadrant, eight were identified as Leaders and one as a Rising Star.

- **Capgemini** presents a significant capability in value engineering around FPGA to ASIC conversion, board redesign for new form factors, and new compliance requirements.
- **eInfochips** has been building an extensive clientele with semiconductor companies that have silicon design capabilities. The company has also been expanding into hardware design services.
- **HCL** operates in a decentralized agile model across its semiconductor business with a team of functional managers for each area, such as system on chips (SoCs) integration, emulation, pre-silicon verification, design for testing (DFT), physical design and post-silicon validation.
- **LTTS'** portfolio presents a healthy mix of business activities across horizontals. Approximately 35 to 40 percent of the semiconductor business comes from VLSI, 10 percent from board design, 20 to 25 percent from software platforms, and the remaining from verification and validation (V&V) (including post silicon and device engineering).
- **TCS's** capabilities in semiconductor engineering span end-to-end support, from pre- and post-silicon validation, VLSI services, FPGA , platform and embedded system services, as well as SoC-enabled technological advances in analog, digital and mixed signal.
- **Tech Mahindra** has significantly invested in new infrastructure, including offshore delivery centers (ODCs) that are compliant with data security standards. The company has strengthened its focus on delivering complex SoC projects.
- **UST's** strategy of turning pre-silicon heavy engagements to complete outsourcing-based turnkey models is poised to deliver superior growth for the semiconductor business.
- **Wipro** has been working across the layers of the semiconductor value chain, from supporting fabless semiconductor companies, semi-intellectual property companies to integrated device manufacturers.
- **Ignitarium** (Rising Star) is well versed in its VLSI work for the automotive industry and embedded multimedia, and is gradually expanding to the software domains in those areas. The company has started exploring areas such as AI and robotics, providing the impetus for growth in the coming years.

CAPGEMINI

Overview

Capgemini, based in Paris, combines its silicon, electronics and embedded capabilities around design, development and integration of semiconductors, boards and software to modify and create innovative electrical and electronic platforms and products. Its credibility in VLSI, embedded hardware and software helps craft intelligent embedded systems, coupled with disruptive technologies across key industries.

Strengths

Alternate mode of design to address chip shortage challenges for automotive suppliers: Capgemini offers a feasibility analysis of alternate sources for chips to suppliers that are affected by chip shortages. Its consultative approach involving board design and V&V enables it to continue supplying to manufacturers and assemblers of the automotive value chain, with a combination of products from the previous source and the alternate one.

Addressing RF chip shortage challenge in the 5G context: A similar shortage is prominent in the telecom and networks space due to the unavailability of RF chips. Semiconductor companies thus have to change the design despite securing alternate supplies. This involves functions such as redoing the RF front end and consolidating functionalities to a bigger field programmable gate array (FPGA) in case of disaggregated systems and OpenRAN. With its complete VLSI capability, experienced analog design teams and extensive embedded software engineering abilities, the company is able to effectively address these requirements.

Enabling enterprises to move up the stack with analog and digital expertise: Capgemini presents capabilities that are independent of the nodes. The VLSI team is experienced in designs across 65, 28, 5, 7, and 3nm nodes, while a sizeable analog design team takes care of the design functions that move beyond the CPU such as the modem.

Caution

Given the high market demand, Capgemini has to turn down at least two requests a week around VLSI.

2021 ISG Provider Lens™ Leader

Post the successful integration of Altran capabilities in the Capgemini ecosystem, the company is set to address the new-age requirements for U.S.-based enterprises to help them move up the stack and create recurring revenue models.

ENTERPRISE CONTEXT

Digital Engineering — Industrial, U.S.

This report is relevant to enterprises in the industrial segment (off-highway transportation) in the U.S. for evaluating providers of digital engineering services.

In this quadrant report, ISG highlights the current market positioning of digital engineering service providers to enterprises in the U.S., and how each provider addresses the key challenges faced in the region.

Most manufacturers in the off-highway segment are considering software-as-a-service (SaaS) to turn the business around quickly and deliver the required agility to adopt to changes. Examples are cutting down on elements of the supply chain to reach the customer in minimal number of steps, scaling the business by building it together with partners and selling with added value . This would only be possible if the relevant data and quality parameters are available in one place. Also, customers mainly consider service providers' experience in engineering and R&D (ERD) services and analyze their differentiating factor for bringing in the digital gauge. While digital technologies have become more prevalent, customers expect value creation in experience in on-demand services such as operation, services and diagnosis.

The manufacturers tend to control the design and manufacturing even when they don't own the manufacturing plants. Thus, they would need to own the process completely or outsource it to a specialist. They would need to control the supply chain and the delivery of the products to the end customer and extract data regarding the use of the products.

Engineering and R&D leaders should read this report to understand the relative positioning and capabilities of providers to help them effectively plan and select product engineering and manufacturing-related services and solutions. The report also shows how the technical and integration capabilities of a service provider compare with the rest in the market.

Digital transformation professionals should read this report to understand how providers of digital engineering services fit their digital transformation initiatives (especially in the manufacturing spectrum) and how they compare with one another.

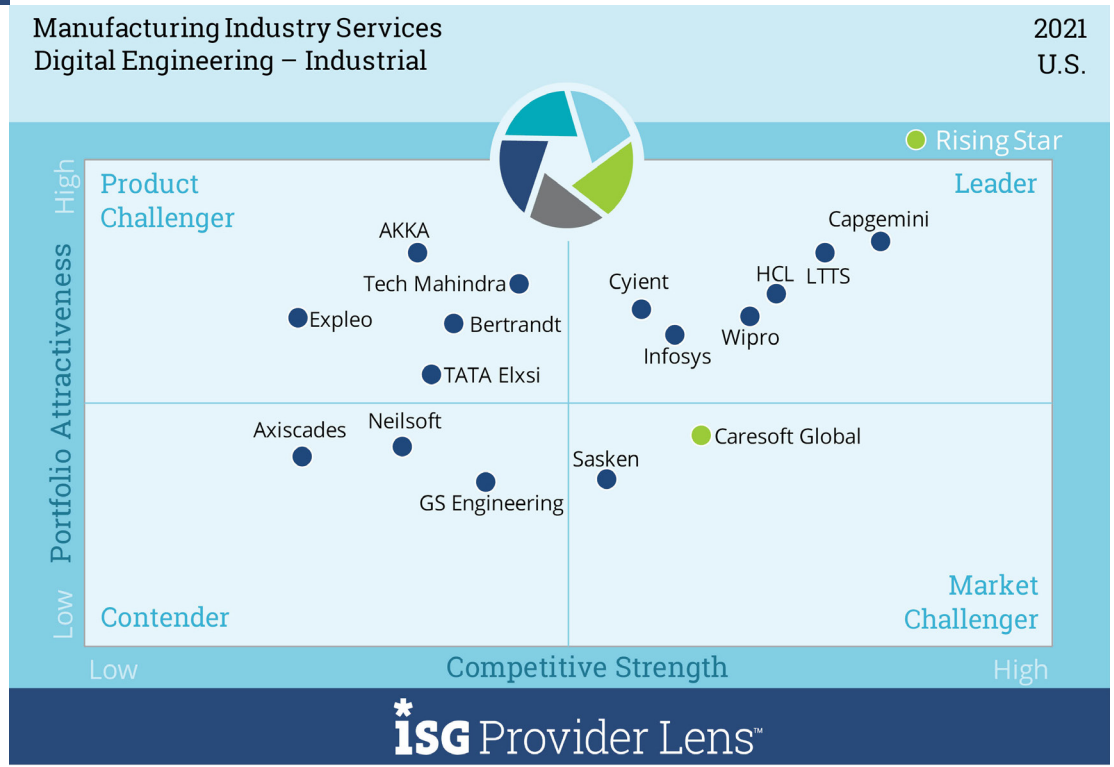
Manufacturing professionals should read this report to develop a better understanding of the current landscape of manufacturing engineering service providers in the U.S.

IT and OT security leaders should read this report to see how service providers address the significant challenges of compliance and security while keeping the manufacturing operations seamless.

DIGITAL ENGINEERING – INDUSTRIAL

Definition

This quadrant analyzes the capability of service providers and/or system integrators to deliver product and manufacturing engineering services to enterprises operating in the industrial and heavy equipment segment (construction equipment, agriculture and forestry, materials handling and production machinery). ISG analyzes the service provider's value proposition of processes associated with product design, design support, design validation and manufacturing support across phases of concept generation, component and tool (jigs and fixture) design, hydraulic/harness routing, tolerance analysis, value engineering and reengineering, 3D modeling, assembly management, static and dynamic analysis, etc. Overall, the quadrant analyzes the ability of providers in empowering enterprises to transform the industrial landscape and accelerate digital strategy implementation. Capabilities in assessing existing supply chains and recommending strategy, process and technology changes to improve efficiencies, lower risk and reduce costs.



Source: ISG Research 2021

DIGITAL ENGINEERING — INDUSTRIAL

Eligibility Criteria

- Ability to support services across levels of manufacturing engineering, post pilot scale
- Demonstrate relevant experience in the consolidation of engineering services and deliver the right balance of onshore/offshore cost arbitrage
- Experience in engineering software development around application development, maintenance and support, and engineering process automation and tools customization as an added advantage

Observations

Among the 16 participants in this quadrant, six were identified as Leaders and one as a Rising Star. Key observations about the Leaders and the Rising Star are below.

- **Capgemini** is recognized as a strategic partner, specializing in engineering and consulting for enterprises that prioritize innovation.
- **Cyient** specializes in enhancing productivity with automation, enabling flexible distribution operations, and leveraging IoT and other new technologies that are critical for the digital ambitions of the off-highway vehicle segment.
- **HCL** leverages its product and manufacturing engineering capabilities to address the challenges that affect the sustainability ambitions of the off-highway vehicle segment.
- **Infosys** has a large presence in the mining, construction and agriculture equipment industries. It is working towards translating the value propositions from the automotive segment to the off-highway space.

DIGITAL ENGINEERING — INDUSTRIAL

Observations (cont.)

- **LTTS** is one of the prominent engineering service providers in the off-highway segment with experience in testing the viability of new-age technologies. It has been formulating the product engineering strategy to accelerate go-to-market.
- **Wipro** enables off-highway vehicle customers to establish optimal control over equipment, driving digitization and improving economies of scale.
- **Caresoft Global** (Rising Star) started its journey in the ERD space from the agriculture and farm equipment segment. It is thus suitably positioned to address the existing challenges faced in this space.

CAPGEMINI

Overview

Capgemini, based in Paris, together with the acquired capabilities from Altran, specializes in driving synergies between the digital and engineering ecosystems to improve operational efficiency, financial viability and scalability for the off-highway and heavy engineering equipment segments in the U.S.

Strengths

Facilitating materials handling companies to increase profitability with clean technologies: Capgemini has been working with several materials handling companies on IoT and telematics aspects. The company's credibility in driving sustainable energy technologies and accelerating the concept to commercialization phase has made it a partner of choice for materials handling companies that are exploring opportunities with hydrogen fuel, fuel cells and other forms of clean energy.

Enabling mining companies to bring up-to-the-minute technology to the forefront: Capgemini has been working closely with mining companies, exploring opportunities with autonomous mining and mine of the future. It engages with clients through an innovation center for accelerating concept to commercialization with the use of cutting-edge technologies.

Driving innovation across the heavy engineering value chain: With heavy equipment manufacturers often carrying out some level of innovation and their end users (companies that rent out the equipment) adding another layer on top of this, Capgemini tends to engage with both sides. This enables the company to drive innovation throughout the value chain across several dimensions such as IoT and connectivity, hydrogen and fuel cell technologies.

Caution

Though Capgemini has been bringing some of its advanced technologies used in Europe to U.S.-based clients, it is mostly recognized as a European engineering major in the region rather than a global market participant.

2021 ISG Provider Lens™ Leader

Being a leader and pioneer in the automotive industry, Capgemini supports off-highway vehicle companies in integrating business technologies, operational technologies and information technologies to drive cost efficiency.

Methodology

METHODOLOGY

The research study "ISG Provider Lens™ Manufacturing Industry Services 2021" analyzes the relevant software vendors/service providers in the U.S. market, based on a multi-phased research and analysis process, and positions these providers based on the ISG Research methodology

The study was divided into the following steps

1. Definition of Manufacturing Industry Services 2021 market
2. Use of questionnaire-based surveys of service providers/vendor across all trend topics
3. Interactive discussions with service providers/vendors on capabilities and use cases
4. Leverage ISG's internal databases & advisor knowledge & experience (wherever applicable)
5. Detailed analysis & evaluation of services & service documentation based on the facts & figures received from providers & other sources.
6. Use of the following key evaluation criteria:
   - Strategy & vision
   - Innovation
   - Brand awareness and presence in the market
   - Sales and partner landscape
   - Breadth and depth of portfolio of services offered
   - Technology advancements

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Avimanyu Basu brings over 10 years of extensive research experience to handle telecommunication and engineering and R&D services specific research deliverables for the program called ISG Provider Lens™ that is designed to deliver research on service provider intelligence. He is responsible for authoring reports on software defined networks and network function virtualization (SDN/NFV) and engineering services. He is also responsible for key vertical-oriented reports and thought leadership papers for manufacturing along with whitepapers revolving around specialized technologies showcased by different cross-section of enterprises.

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