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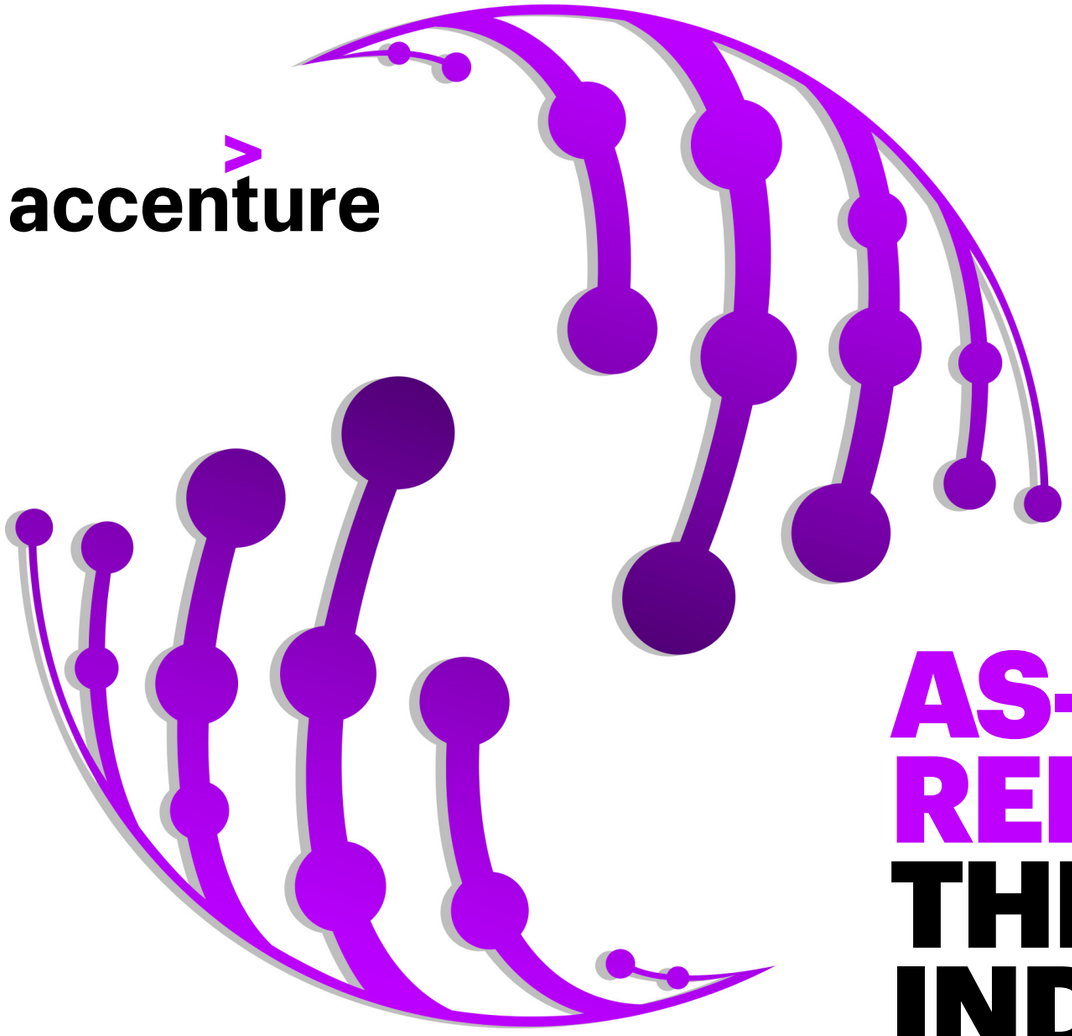

AS-A-SERVICE QUICK REFERENCE GUIDE FOR THE SEMICONDUCTOR INDUSTRY

Accenture Strategy & Consulting

THE AAS QUICK REFERENCE GUIDE FOR THE SEMICONDUCTOR INDUSTRY

There are many AaS models that are applicable to the semiconductor industry. However, what might work for one semiconductor company might not work for another. Therefore, it is important to carefully assess the different models to determine which one applies to your industry and more importantly, your company. Here is an overview of the various models.

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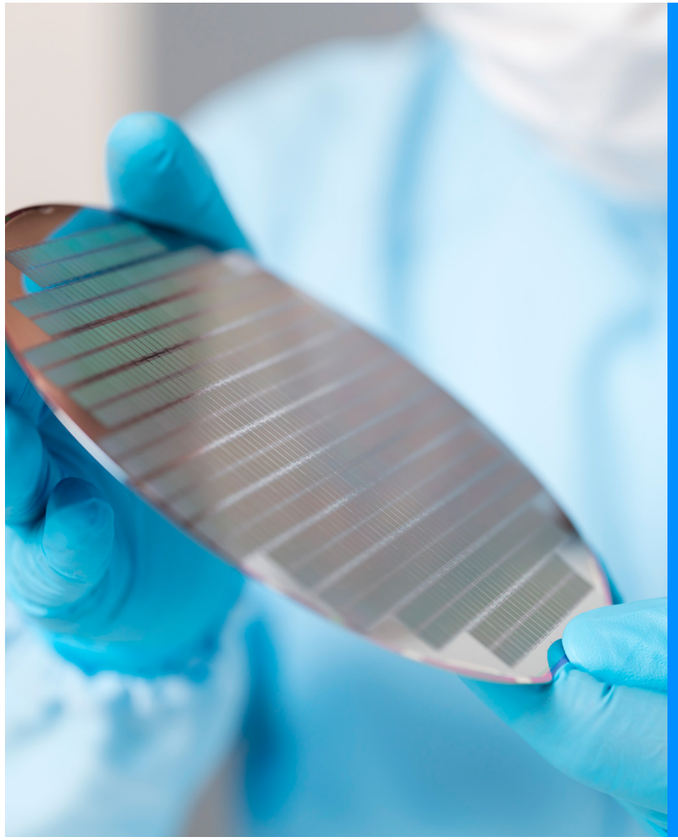
Manufacturing AaS (MaaS)



MaaS allows manufacturers to specialize in semiconductor manufacturing, R&D and operations, while other "fabless" companies specialize in other parts of the value chain. Manufacturers gain efficiencies by pooling demand from many customers, thereby maintaining high-capacity utilization and lowering costs for everyone in the ecosystem.

With the foundry-fabless model firmly established in the industry, MaaS is a mature offering from foundries and OSATs such as TSMC and ASE respectively.[1] These companies are also leveraging the cloud to enable customers to communicate their design/manufacturing needs and capacities automatically, enabling complex production tasks to be executed collaboratively.

Key things to consider when looking at MaaS models:

1. Manufacturers must understand their value proposition to design houses relative to their competition (technology, operational efficiency, and scale, etc.) and accordingly invest in capabilities.

2. Manufacturers need to have the ability to forecast end-customer demand by technology/node to anticipate market changes and have mechanisms to prioritize customers.

3. Manufacturers should have a clear strategy and vision for their place in the value chain. They need to determine if they want their core manufacturing business (foundry model), or if they want to start to compete with their customers/suppliers by having more vertically integrated offerings (waterfall model).

4. Design houses need a clear strategy for single or multi-sourcing from manufacturers.

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Equipment AaS (EaaS)

In this model, the semiconductor industry leases equipment and includes services such as equipment install, maintenance, managing consumables, chemicals, and providing more analytics/simulation and modeling to optimize process.

EaaS offers many advantages to equipment makers, such as predictable revenue streams and an ability to capture more revenue from the equipment.

Equipment revenue can consist of ongoing maintenance, spare parts, peripherals, and data and analytics services. It also provides benefits to equipment users by eliminating large upfront capex, which lowers risky opex expenses. Enabling customers to get access to state-of-the-art equipment, while still focusing on their core business.

Key things to consider when looking at EaaS models:

1. Companies need to be aligned on what value the equipment brings to the user, and how that value can be shared with the equipment maker.

2. Pricing models need to be evaluated to determine whether an outcome-based model or usage-based model is best. An outcome-based model is preferable when the outcome (whether financial or manufacturing) is well known and agreed upon. Alternatively, a usage-based model is preferable when unit operations of the equipment are well quantized and measured.

3. Companies need to take into consideration planned obsolescence and tool upgrades. While developing the ability to price in material feature changes in addition to tool upgrades.

4. In this model, equipment maker organizations need to be better prepared to be a service organization in the following ways:

a. Financial investment and ROI
b. Product design to enable greater monitoring and self-service of equipment
c. Contracting and pricing strategy that encompasses customer value
d. Sales and customer service
e. Setting up infrastructure to extract data from equipment in factory environment at the user location to a centralized location

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Yield AaS (YaaS)

Many companies do not have the R&D budgets and scale to create state-of-the-art analytics capabilities in-house in order to improve yield.

To better compete in the marketplace, they can obtain these services from third-party yield management companies. They offer superior analytics tools and infrastructure to their customers by cross learning from many customers, often delivered on a cloud platform.

Key things to consider when looking at YaaS models:

1. There is no one vendor that has expertise in end-to-end analytics in the product and manufacturing lifecycle. Companies have strengths in one or more distinct areas such as yield management, prediction, process control, metrology optimization, DFM solutions, and test analytics and optimization.

2. Data availability and sharing across the supply chain greatly increases the quality of insights derived from analytics. This remains a challenge due to IP protection concerns.

3. Borrowing from the software industry, many yield services are beginning to run on cloud infrastructure provided by hyperscalers. Location of sensitive data (outside the company data centers) and the velocity and volume of data that needs to be backhauled presents an ideal edge analytics use case.

An example of a YaaS is Applied Materials, Applied Fabvantage Consulting offering analyses in tool output, yield, predictability, fab productivity and cycle time.[2] Other examples include AI-based big data analytics software companies such as Optimal+.[3]

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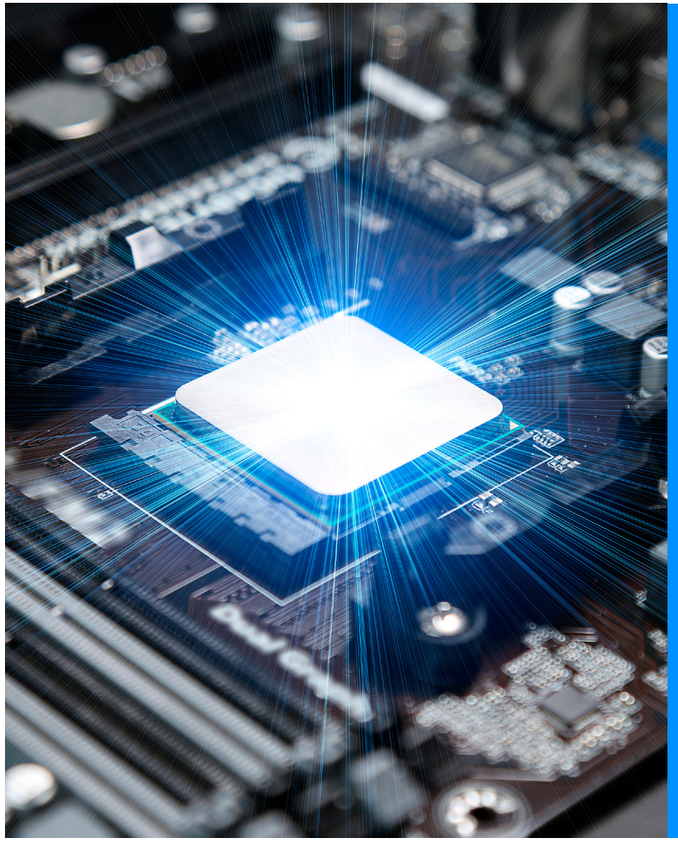
Silicon AaS (SiaaS)



In this model, customers are charged based on usage of actual silicon devices (transistors, cores and features). Successful use cases of this model include Google TPU, Nvidia GPU Cloud, Qualcomm Wireless Edge (IoT),[4] Accelize GZIP compression[5] and Intel.[6]

This model allows silicon IP companies to generate revenue beyond the initial point of sale. It is especially relevant for the AI market where FPGA and GPU companies can provide their chips in the cloud and at the edge for customers to use through the device lifecycle.

This is also important in the IoT space where silicon OEMs can more easily provide end-user services that combine security and feature management in a subscription model.

Key things to consider when looking at SiaaS models:

1. Design houses and IP integrators need an accurate, traceable and verifiable IP inventory with versioning and configuration in their PLM system for royalty calculation.

2. IP producers need to configure and activate in a flexible and traceable manner.

3. IP producers must have the ability to securely meter the use of their IP and retrieve that information for royalty charging.

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Design AaS (DaaS)

This subscription-based approach involves IP houses offering customization platforms and services so customers can more quickly create their own designs at lower costs. EMS providers such as Jabil, Flextronics and Hon Hai have been providing design services and reference designs to system integrators for at least 15 years. They already have the manufacturing capacity, supplier relationships and are very close to the customers, often working very closely with OEMs and system integrators. Another, more recent example has emerged due to the prohibitive silicon nodes cost for many IoT and edge computing devices. The focus has shifted towards extracting performance and power advantages by customizing IP and open source instruction set architecture such as RISC-V and MIPS. Companies such as SiFive are emerging to provide cloud-enabled design services to design custom silicon on RISC-V.[7]

There are many advantages to a DaaS model. Companies can design custom silicon for their applications without large design teams, and without paying an upfront license fee. In addition, the reuse of verified cores and IP blocks can reduce design cycles from years to months.

Key things to consider when looking at DaaS models:

1. In-house vs. third-party vs. open source – Total cost of ownership, time to market, and available talent.

2. Impact of geopolitics and IP export control on the long-term availability of IP and services.

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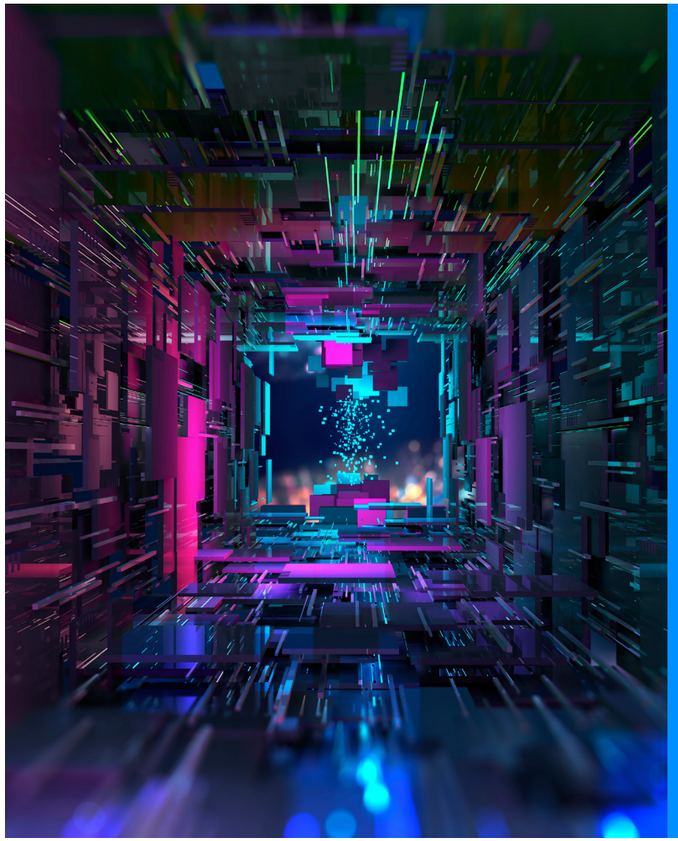
Quantum AaS (QaaS)



Continuous investments and developments have propelled quantum computing from a theoretical concept into a tangible computing option for enterprises. In response, a number of companies are providing cloud-based services to access quantum computing resources remotely, similar to how AWS and Azure[8] provide infrastructure as a service today on the public cloud. Companies that are exploring this area include IBM, Microsoft,[9] Dwave, Rigetti, and Amazon.

The range of use cases presently range from logistics and route optimization to speeding up drug discovery for diseases. While QaaS is a new emerging concept, many enterprises and system integration companies are interested in starting their learning curve in this disruptive technology space early.

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About Accenture Semiconductor

Accenture Semiconductor is committed to working with semiconductor manufacturers and companies to help capitalize on the opportunities created by digital disruption and optimize efficiencies across product development, manufacturing, supply chain and business operations.

We have deep relationships, experience, and expertise across the semiconductor ecosystem: foundries, fabless, equipment makers, and IDM. Along with dedicated practice areas and proven results in mergers and acquisitions, engineering operations, test strategy development, new product introductions, supply chain sourcing/warehouse operations and manufacturing analytics.

www.accenture.com/semiconductors

References

1. "Sustainable Growth Through Strategic Innovation", Mitsuru Kodama, January 26, 2018.
2. "YaaS deployment – Applied Materials' Fabvantage Consulting," Applied Materials, 2019.
3. "Optimal+ Overview", 2020.
4. https://www.qualcomm.com/news/onq/2018/08/30/wireless-edge-key-realizing-full-potential-5g
5. https://moorinsightsstrategy.com/startup-accelize-simplifies-fpga-acceleration/
6. https://www.intel.com/content/www/us/en/products/docs/processors/cpu-vs-gpu.html
7. https://www.eetimes.com/sifive-preps-risc-v-cloud-service/
8. https://azure.microsoft.com/en-us/services/quantum/
9. https://www.microsoft.com/en-us/quantum/technology