

Metaverse in Semiconductor Potential to Revolutionize the Industry

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Contents

1. Executive Summary	1
2. Problems plaguing the Semiconductor Industry	2
3. Metaverse to transform the Semiconductor Industry	3
4. Conclusion	4
5. Authors	4
6. Sources	4

Executive Summary

□ **Semiconductor, a highly specialized engineering field, is a competitive industry with an exceptionally complicated global supply chain**

- Each module in the process chain – manufacturing equipment, designing, raw materials, production, testing and packaging, component integration, installation in the final product – has varying requirements of technology, labor, capital, R&D, resource presence
- As such, the parts of the supply chain moved to countries or regions with comparative advantages, making the chain vulnerable to global shocks or events

□ **With Metaverse and Digital Twin technology, the semiconductor industry can be transformed in unprecedented ways**

- Digital Twin has already found applications in many industries which has allowed for simulation runs prior to implementing changes in the factory

□ **Metaverse, however, needs to mature not only in terms of the technology but also in working out a profitable business model**

- Though some limited uses are visible in the industry, a full-scale adoption of Metaverse is needed to achieve its full potential in solving industry shortcomings
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Introduction – Problems Concerning the Semiconductor Industry

Complex supply chains of the chip industry, spread across the world, have added to the demand-supply mismatch and worsened choking at many value chain points, creating a cascading effect on other industries

Current Problems

Supply Chain Issues and Complexity



- Supply chain issues have worsened since H2 2019 due to a series of events – fires in plants, shortages in energy, and the pandemic
- Moreover, Covid-19 accelerated the demand for consumer electronics, with a surge in demand for chips
- The unforeseen high demand coupled with supply issues, led to huge lead times for the chips that ran into months
- This compounded the problems that already existed due to the complex supply chains. Bullwhip effect persisted, i.e., a small variation in demand led to large response from the suppliers and end producers

Shift in Demand Levels and High Lead Times



- The industry currently operates at maximum capacity utilization, and still lags in meeting the demand
- Complicated chips forced players in the value chain to operate in their own specialized areas or niches
 - Also, the barriers to entry are high due to significant capex and steep learning curve needed in this space
- Building a new fabrication plant takes a minimum of 2-4 years, thus, making it difficult to scale up with shifted demand levels, leading to choking at foundry levels

Potential Answers



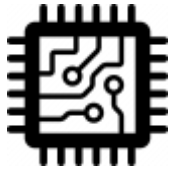
- Visibility across the entire supply chain and seamless flow of communication between all stakeholders
 - Better visibility in demand and projections, and quicker ramp up or down of production facilities by the manufacturers
 - E.g., significant shortages in trailing edge chips continues, while most new fab investments are into leading edge chips
- Collaboration between customers or OEMs, fabless, fabs during the chip design phase. Production as per final product requirements and the available raw materials



Metaverse – to Transform the Semiconductor Industry

With its new data-enriched digital world and an end-to-end visibility into supply chain for all stakeholders, metaverse reduces the bullwhip effect, enables effective collaboration and increases efficiency

Interactive Digital World

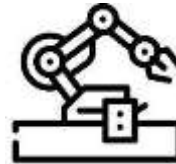


Chip Designing on Metaverse using AR/ VR/ MR*

- Enables easier replication of ideas into 3D designs in a physical space
- Allows immersive, interactive viewing and editing at granular levels
- Lowers R&D costs on complex chip designs

Access to digital machines, equipment on the metaverse world

- Provides remote, interactive trainings to workers in a virtual world, and makes it highly scalable
- Improves timeliness and quality of issue resolution and maintenance, as VR allows for remote and intricate screens



Superior factory inspections by workers using AR

- Provides enhanced inspections as site views are superimposed with real-time IoT data and associated AI, data analytics

Digital Twin Technology



3D digital model of a chip manufacturing plant

- Comes embedded with real-time updates from the IoT data and an artificial Intelligence (AI) to detect issues
- Runs simulations prior to actual implementation which tests various scenarios for plant planning, operations, and process flow modifications
 - Saves capital and time
 - Helps identify challenges prior to an actual roll-out

Effective collaboration between supply chain parties

- Replicates all parts of the supply chain on digital twin
- Updates changes simultaneously in any of the levels
- Offers an end-to-end view of the supply chain to all stakeholders and facilitates collaborative planning, e.g.
 - Customers can assess the fit of a chip prior to packaging
 - Customers can directly work with the IDMs on digital twin



Metaverse presents significant growth and cost saving opportunities for 'early adopters' in the industry

Conclusion

Metaverse will see greater adoption in the semiconductor industry as companies realize its potential in not just solving the current supply chain issues, but also improving the efficiency of the manufacturing process

- **Semiconductor, a specialized and competitive industry has several complexities**
 - Each module in its supply chain is based in different countries or regions with comparative advantages
 - Involves significant R&D costs and time at every step of a chip building process
- **Metaverse and the Digital Twin technology can revolutionize the entire semiconductor industry in unprecedented ways**
 - Every component of the supply chain gets replicated on a digital twin and that allows for effective and efficient collaboration between stakeholders by providing a complete view of the process
 - Remote training of workers, servicing of factories and plants are possible in a seamless and highly scalable manner
 - Shop floor visits and reviews can be made effective with the additional support of real-time data and AI analytics
- **Nevertheless, there are significant challenges in its adoption as metaverse industry itself needs to stabilize in its applications, business models and technology to identify the entire gamut of its possibilities and use cases**

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Select Sources

- Semiconductor Industry Association report, 2021
- CNBC, Bloomberg news reports on semiconductor, 2020, 2021, 2022

About Transjovan Capital

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