The Semiconductor Business Risk Conundrum: MES Status Quo or Migration?

By Julie Fraser, VP of Research for Operations and Manufacturing, Tech-Clarity, Inc.

Executive Summary

Semiconductor companies are pioneers in MES – I was there to see the adoption 30 years ago. Many companies continue to use software that's over a decade old and no longer supported by the provider.

Is it riskier to migrate or keep the status quo? Those older systems pose enormous business risks. They are also a significant resource drain in IT and operations during severe skills shortages.

Short answer: Status quo is a higher risk, particularly as these systems' advocates and administrators look to retire.
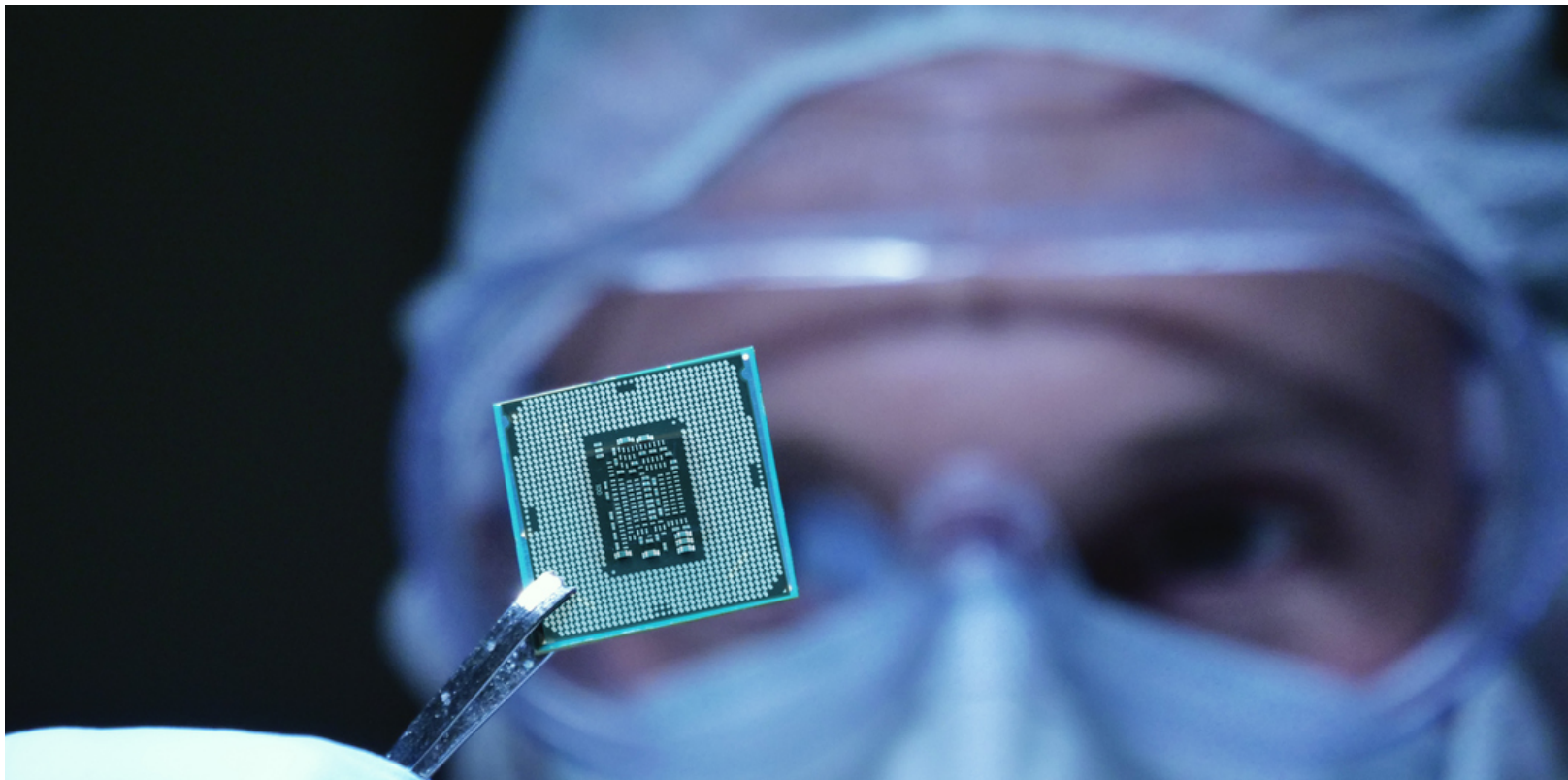
Semiconductor Company Risks

While the long-term outlook for semiconductor companies is rosy, the current situation is precarious. "It turns out that there may be something worse for the global chip industry than shortage or oversupply: having both at once," according to [Deloitte.](#)[1]

On the one hand, economic, geopolitical, and demand uncertainties have led some companies to cut costs. The entire high tech industry has been poised for a significant downturn. On the other hand, new incentives and foundries mean new opportunities but also new competitors and supply chain risks.

Reconfigured supply chains based on onshoring, nearshoring, and friendshoring will likely have long-term implications. The modern economy rests on semiconductors, so risks to this industry are a risk to all. In this environment, semiconductor makers need to produce reliably. Foremost, they must generate output more cost-effectively, efficiently, and confidently.

Production Risk Conundrum

As the past several years have shown, with demand shifting from many industries and applications to medical and back, being resilient and flexible is crucial. For example, the automotive industry is still feeling the ripple effects of semiconductor supply challenges as chip makers re-focus on their businesses and inventories.

The risk of not being agile enough to make the right (in-demand) products at the right time is a haunting challenge for the industry. Having lived through this recently, this is no esoteric secret. Companies need to

- Get to and sustain top yield and throughput for constrained-supply products
- Be cost-effective and make a margin on products in oversupply
- Ensure design wins; with new supply chains forming, being preferred or on the AVL matters more than ever
- Innovate effectively both in products and in production processes.

MES Situation

Our research shows that many in the semiconductor industry use older legacy MES. Some of these applications are no longer supported. Some of the hardware they run on is no longer available commercially.

These older MES have typically been customized and have many custom add-ons and integrations to keep fab or AT operations running. The programmers who developed and maintain these systems are often nearing or past retirement age. The languages they are coded in are typically different from what students learn in school, so backfilling to keep those customizations fresh is challenging.

Many semiconductor companies have different vintages and different MES products in various locations. With older systems, IDMs typically have different MES for fab vs. AT. Having multiple customized systems adds to the technical debt. It also means that the few trained employees need help moving from one facility to another. For IDMs, there is often a break in the data that poses risks between fabrication and the backend assembly and test process.

MES Migration Risks

Change is always a risk once production processes are working. MES is the way

to guide each part of the process, and as such, is crucial to outcomes such as yield, speed, reliability, and binning. MES is a foundation for reliable semiconductor manufacturing.

In the past, facilities needed to come out of operation for days or weeks to change to a new MES. This poses clear risks. Downtime is hugely expensive and hurts revenue for products that are in shortage.

And the go-live was not the end of the risk. Once a facility got past cutover, in many cases, there were additional productivity and yield losses for some time.

The high risk and poor past experience make semiconductor companies wary of migrating to a new MES. This is a significant reason why many semiconductor companies use legacy, customized MES.

However, some of these risks can be much lower now than in the past. Plus, the risk and burden of staying with a legacy MES continues to rise.

Status Quo MES Risks

The risks of continuing with older MES are less evident and well-understood than the migration risks. Yet they are no less severe and have a longer-lasting, more profound impact.

Older systems are not flexible. Enabling an older MES to keep up with constant change takes tremendous effort and expertise. Heroic MES programmers and administrators in these situations have job security but at a price for the company.

- Data disconnects within the plant are rife; between fabs and backends is a given.
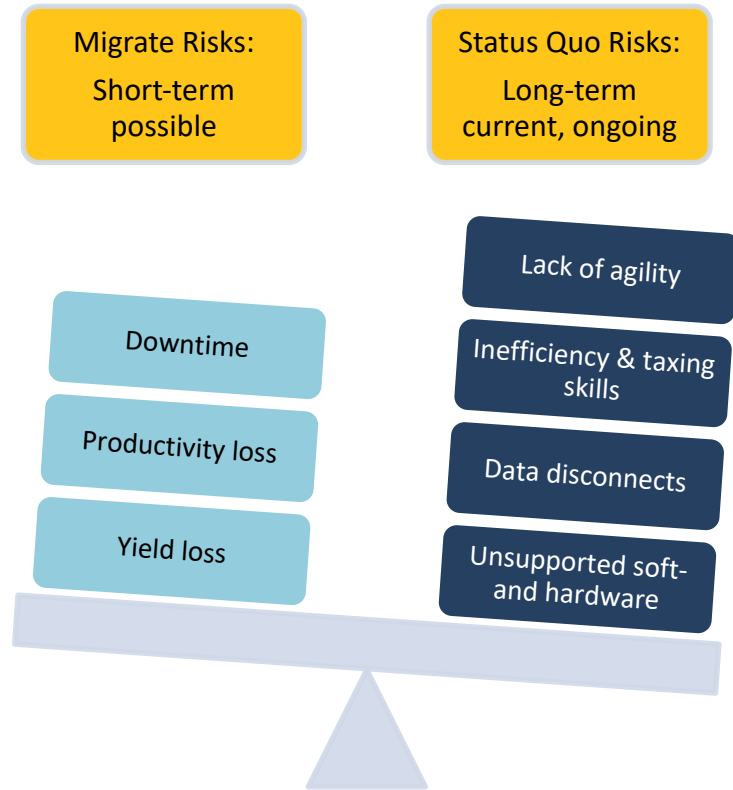
- Operations and engineering struggle to make changes and improvements or even run test lots confidently.
- Hardware and software are often no longer supported by the provider, leaving the onus and risk on the semiconductor company.
- IT burden is heavy compared to modern MES maintenance.
- Semiconductor MES administrators and experts for these older systems are retiring, leaving the system without people who can reliably keep it – and production – running. Overall industry skill shortages exacerbate this.

Selecting the Next MES

Some of the keys to succeeding with migration are to find an MES that:

- Is proven in semiconductor and meets the new definition (see previous article, "Redefining Semiconductor MES" for more detail)
- Can integrate efficiently and confidently with existing systems for gradual, phased migration or replace them in "big bang"
- Delivers significantly more value than the current MES can for years to come, surpassing older systems in both functionality and technology.

The MES provider must also have deep semiconductor expertise and be ready to support the implementation in new or existing facilities. Ideally, you find an MES that works for both high-volume and experimental settings, fab and backend, to get you to an enterprise-wide MES standard.

Migrate Risks:

Short-term
possible

Status Quo Risks:

Long-term
current, ongoing

Lack of agility

Inefficiency & taxing skills

Downtime

Data disconnects

Productivity loss

Unsupported soft- and hardware

Yield loss

Migrate for Now and Future

There is a decision to make for many semiconductor companies: MES status quo or migrate to new?

This may appear to be a heavy conundrum, but the industry dynamics are making it more and more apparent. The conclusion that an increasing number of semiconductor companies are reaching is that migration to modern MES is a smaller risk than continuing to build on the outmoded status quo.

At the tail end of many supply chains, the semiconductor is inherently a cyclical industry. Be ready for the next upturn or downturn, plus needed innovation with far less IT and operations effort. The time to switch to a modern MES is upon every semiconductor company.

1. 2023 Semiconductor industry Outlook, © 2023 Deloitte Global
   https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/semiconductor-industry-outlook.html

About the Author

Julie Fraser joined Tech-Clarity in 2020 and has over 35 years of experience in the manufacturing software industry. She is an enthusiastic researcher, author, and speaker. She has a passion for manufacturing progress and performance gains through Industry 4.0 strategies and supporting software technology.

Julie is actively researching the impact of digital transformation and technology convergence in the manufacturing industries, with a focus on supply chain and plant floor and how to use manufacturing data in conjunction with data from offices, labs, and the ecosystem.

About Tech-Clarity

Tech-Clarity is an independent research firm dedicated to making the business value of technology clear. We analyze how companies improve innovation, product development, design, engineering, manufacturing, and service performance through the use of digital transformation, best practices, software technology, industrial automation, and IT services.