

CASE STUDY

Tempo's Automated PCB Manufacturing Improves Predictability and Outcome of GE Healthcare's Development Cycle

The Ability to Fail and Iterate Faster Reduces Development Time

Developing critical medical systems requires the ability to design, build, test and redesign until the device precisely meets its performance requirements. The number of cycles needed to arrive at the final design can be elusive during initial production scheduling, especially for new products. Managing the risk of failing to meet production deadlines can rest on your contract manufacturer (CM) being able to produce quality boards quickly.

At GE Healthcare Life Sciences, Microscopy Imaging Systems, Jason Metzner, the Lead Electrical Engineer, is responsible for the development of all electrical subsystems. This requires him to drive technical projects, allocate resources and manage contractors in accordance with organizational policies and objectives. He is well aware of the impact that a CM can have on a project's development schedule.

About a year ago, Jason was looking for turnkey PCB manufacturers that could provide better service and quality at a lower price than he was getting from his current CM. With this CM, lead times were usually 3 - 4 weeks and could take up to 5 weeks. Simply getting a quote for a new design took an entire week. In addition to the quality being lower than desired, the service was expensive. Unbeknownst to Jason, a potential solution to his CM problem, Tempo Automation, had been explored previously by Dennis Sauer also of GE Healthcare, and he was thoroughly impressed!



**GE Healthcare
Life Sciences**

Company GE Healthcare Life Sciences, Microscopy Imaging

Website www.gelifesciences.com

Product DeltaVision Ultra High-resolution Microscope



“Being able to fail faster had a direct impact on our time line.”

—Jason Metzner
Lead Electrical Engineer
GE Healthcare Life Sciences



"Tempo's Fast Automated Service is Shocking"

"Honestly quite shocked..." was Dennis' response to Tempo providing his quote within a couple of hours with no Gerbers needed, as Tempo can work with several EDA native CAD or ODB++ files. Not only was Tempo's quote faster than that of a local PCB shop Dennis had worked with, but the turnaround time for the complete turnkey service, board fabrication, component procurement and PCB assembly was significantly faster as well. Furthermore, the price was \$1,000 lower than the local shop's estimate. For obvious reasons, Dennis decided to turn to Tempo for GE Healthcare's future PCB manufacturing needs.

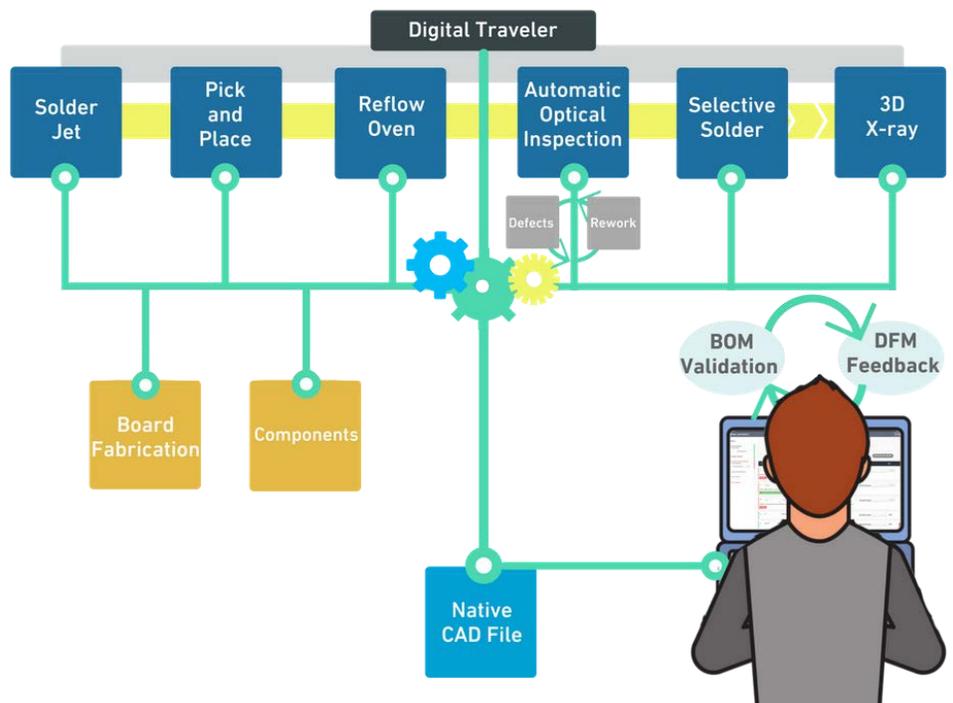
Large corporations typically have preferred vendors that are qualified prior to providing any services. GE Healthcare is no different. Therefore, commitments to add manufacturing vendors are not made lightly. However, Tempo was already working with other entities under the GE umbrella, including Baker Hughes and GE Inspection Technologies. These relationships made it easier for Jason to get started as Tempo is a registered Indirect R&D Prototype vendor.

So far, GE Healthcare's work with Tempo has included the manufacture of complex designs and the construction and programming of a test fixture for design testing. The initial designs involved some DFM and component issues that needed to be resolved prior to manufacture. However, after Jason brought Tempo onboard and began working with Tempo's DFM engineers, these complications were quickly ironed out.

Tempo employs an automated, proprietary software-driven PCB manufacturing process, which begins with the receipt of the design files and BOM from the client. Unlike Jason's previous CM, Tempo requires far fewer files and the back-and-forth (if needed), usually initiated by Tempo, is shorter, and more meaningful. After becoming more familiar with Tempo's design file transfer process, Jason liked the convenience of being able to easily "drag and drop Altium files online."

Tempo's Automated Digital Traveler

The Tempo platform is the backbone of our manufacturing process, automating all functions for component acquisition, assembly in addition to providing engineers with a portal for real-time PCBA quoting and ordering.





Although Tempo is the industry's fastest turnkey prototype PCB manufacturer and delivers precise, high-quality boards, the primary focus is on creating the best customer experience possible. The capabilities of a proprietary platform and focus on customer experience enable Tempo to deliver an outstanding level of service and quality:

- **White Box PCB Manufacturing Service Model**

Tempo's service model that strives to forge a transparent, symbiotic relationship with each client such that designs incorporate DFM specifications that ensure manufacturability and PCBs that incorporate the intent of the design.

- **Robotic Comprehensive Assembly Facility**

Comprehensive software-driven advanced PCB assembly factory.

- **Automated Design File Transfer**

Secure, internet accessible file transfer capable of recognizing and processing design file formats.

- **Custom BOM Tool**

Customized component verification software program to ensure availability and BOM matching.

- **Fast Fabrication Partners**

Dedicated fabricators capable of fast, complex, customized board construction and layouts.

- **Dependable Component Vendor Partners**

Use of vendors with the largest and broadest inventories committed to component security.

- **Experienced, Dedicated Professionals**

Engineers, technicians and other highly qualified professionals committed to quality service and customer satisfaction.

Fast Turnaround Times Brings Predictability to GE Healthcare's Development Process

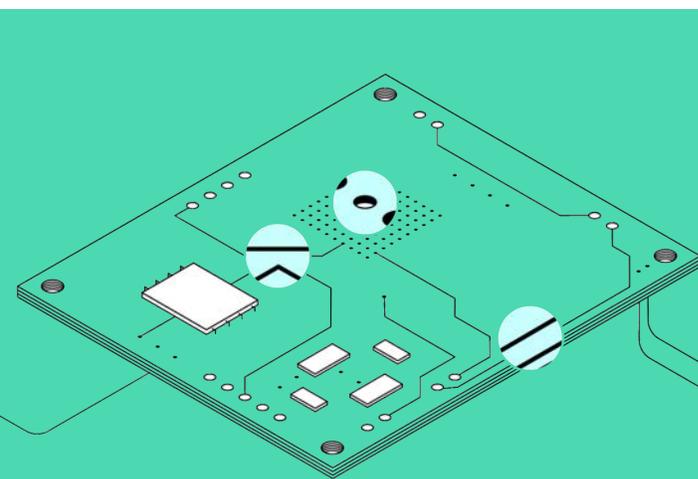
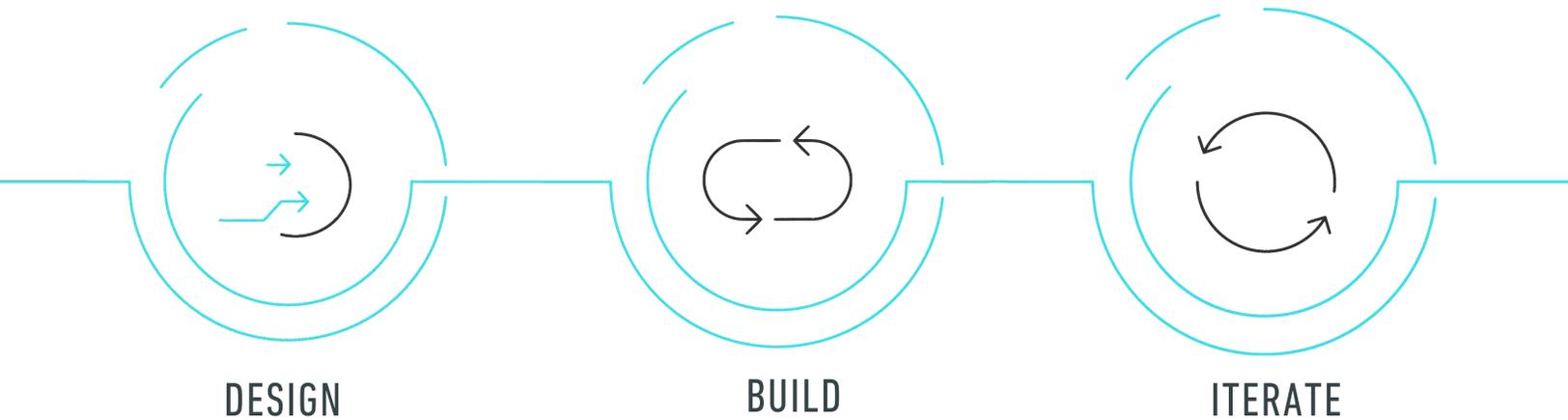
For GE Healthcare, quality and precision are very important as the products they make contribute to life-saving discoveries by hospitals, research laboratories, institutes and universities. These high standards can only be achieved when Jason and his team have time to quickly fail and iterate. As any designer knows, only the most rudimentary of designs can be perfect on the first try. Therefore, the product development process must include a built-in cycle to accommodate failure and iteration. The faster you can get your boards back from the CM, the more time you have for testing and redesign, which enhances the level of innovation and in turn, increases the chances of higher quality and more precise designs.

Before Tempo, Jason routinely had to wait for an entire month to receive boards and even longer for new designs. These long wait times compromised his chances of meeting design deadlines. Tempo was able to deliver complex boards within 5 days, which significantly shortened the 'fail and iterate' process. Being able to fail faster had a "direct impact on our timeline," stated Jason. It also resulted in a better quality prototype—for testing/revision or the product.



A major thrust for Tempo is transforming the classical black box approach to PCB manufacturing into an open, transparent partnership or white box model. With the black box approach, PCB design and PCB manufacturing are typically isolated stages of PCB development that require considerable time to make corrections to the design files before the board layout specifications are synchronized with the equipment capabilities and processes of the CM. The white box model essentially brings the factory to the designer such that the initial design specifications are within acceptable tolerances for the CM's equipment. Explaining that he had experienced the former approach far too often, Jason asserted that he had "time wasted on boards for back and forth questions" that should have been avoidable.

Jason was quite impressed with working with Tempo. In summarizing the Tempo experience, he affirmed, "Good customer service, lead time is good, and cost is reasonable for the quality that you get." In fact, Tempo's ability to deliver highly complex boards fast with a good quality/cost ratio has motivated Jason to push for expanding Tempo's current Indirect R&D Prototype vendor service qualification status to include the more stringent Direct Production vendor status. This will allow GE Healthcare and other GE entities to experience Tempo's unique fast, automated service to improve the predictability and outcomes of their production and prototyping.



Tempo is the world's fastest low-volume electronics manufacturer,

using software-driven automation to deliver complex designs with unprecedented speed, quality, and transparency.

From rockets to robots, autonomous cars to drones, many of America's fast-moving enterprises are already working with Tempo to optimize for a new level of business advantage.

And set a new tempo for progress.

For more information visit www.tempoautomation.com or follow us on Twitter: [@TempoAutomation](https://twitter.com/TempoAutomation).