

■ HOW DIGITAL IS ACCELERATING INNOVATION ■

DISCUSSION AND INSIGHT
FROM KEITH MURR,
PRINCIPAL ENGINEER
AT TE CONNECTIVITY



HOW DIGITAL ENGINEERING IS ACCELERATING INNOVATION FOR ENTREPRENEURS & INVENTORS

Discussion and insight from Keith Murr, Principal Engineer at TE Connectivity.

Keith Murr has been an integral part of TE Connectivity (TE) for the past 23 years. Today, Keith is part of a team that leads the conceptualization, piloting and the implementation of TE's new digital product, process and manufacturing platform.

In this article, Keith shares how TE is using digital to improve how our engineers create, collaborate and innovate—from concept to final product—in a faster, leaner way and provides insights on what digital can do for entrepreneurs / inventors to enhance their innovation, design and business processes.

Q: WHAT DOES IT MEAN FOR ENGINEERS AND TE WHEN WE SAY THAT THE BUSINESS CREATION PROCESS HAS GONE DIGITAL?

A: Digital can mean many things. To TE it means connecting all of our design processes, manufacturing, and operations activities, data and knowledge. To individuals, it means connecting their living environment to their personal environment,

Q: WHAT'S THE DIFFERENCE BETWEEN A "LIVING" ENVIRONMENT AND A "PERSONAL" ENVIRONMENT?

A: Sensors and the Internet of Things (IoT) are changing our environments rapidly. "Personal" environment relates to, for example, the wearables that allow us to view and track our own personal activity and biometrics in new and exciting ways. Our "living" environments refers to our homes, schools, cars and work places, which have also become new domains of connectivity.

Q: HOW DOES HAVING ALL THESE THINGS CONNECTED RESHAPE YOUR DEVELOPMENT PROCESS AT TE?

A: Driving engineering productivity and reducing time to market is ultimately the goal. We are now giving our engineers new levels of access to data from our manufacturing process that's channeled back to the engineers who are working on the next product design cycle. The digital "thread" then continues to connect



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the processes by which TE designs the tools that make the parts—the dies, molds, assembly lines, plating lines, and of course, the manufacturing data and documentation that accompanies these processes. When interconnected, all those data points give a very powerful and exponentially more effective way to preemptively avoid design turn backs and manufacturing bottlenecks, resulting in higher quality levels.

Q: WHAT DOES THE DIGITAL ENGINEERING PROCESS MEAN TO THE BUSINESS OWNER/ ENTREPRENEUR?

A: To the business owner, digital engineering means linking all company activities, data and business analytics into one platform and then being able to parse that data based on very specific metrics, rapidly. Digital engineering gives the entrepreneur/inventor the power to collaborate locally and globally, search the entire world for solutions, and most importantly, have more time for the creative design process. In the end, all of this allows both the business owner and the entrepreneur to visualize their operations in new and powerful ways.

Q: SO WHAT WILL THE DIGITAL WORKSPACE LOOK LIKE FOR ENTREPRENEURS AND DESIGNERS IN THE NEAR FUTURE?

A: Already you're seeing its beginnings. People are using what looks like a "crime scene investigation" workbench where they take their fingers and swipe everything up to the big screen from the tabletop. They can essentially connect everything in their entire world through touch screens whether it's their jobs, educations, or their home. But don't look at it as a screen. Don't look at it as glass. Look at it as connected information. The entrepreneur / inventor can connect drawings and models with collaborators from around the world and get instantaneous feedback from people designing the same things. Ratcheting up speed of development is one of the powers of a digital connected world. Inventors can spend more time dreaming and then whipping up their thoughts versus digging around in boxes of parts and filed-away papers that just takes too long to search through.

Q: SO FROM A DESIGN PERSPECTIVE, HAS THE CREATION AND PROTOTYPING PROCESS BECOME EXPEDITED FOR THE ENTREPRENEUR OR DESIGNER?

A: Absolutely. It comes down to the ability to transform ideas into three-dimensional geometries, into samples

through 3D printing, additive manufacturing and computer-controlled machining. That is the ultimate benefit of the evolved digital maker space. One can begin rapidly prototyping parts, shapes and pieces for a product very quickly. At the same time, you're saving all that information, end-to-end. It's all connected and tied together. You can go back and look at your history. You can share it through file transfers, virtual reality, or augmented reality.

Q: OTHER THAN 3D PRINTING, ARE THERE ANY SPECIFIC TECHNOLOGIES THAT PEOPLE ARE USING TO BRING THEIR IDEAS QUICKER TO LIFE?

A: There are virtual and augmented reality applications out there now. One I saw lets you virtually see a three-dimensional motorcycle and all its embedded knowledge on your smart phone or tablet. The app illustrates various design options, seeing views of modeled components on the motorcycle and the knowledge that's behind every part. All of this is before you ever prototype any part. It's an incredible amount of visualization that's done just through an app on your screen.

Q: SO, WITH APPS LIKE THESE, DIGITAL REALLY DOES MEAN COMPLETELY GETTING RID OF PAPER, RIGHT?

A: Well, that's just the beginning and somewhat a misconception. Removing paper is just a small part of a digital journey. It's more than just "no paper." What's embedded in the 3D schematic are all the parts files, all the material lists, engineering knowledge, exploded views, dimensions, etc. So while it's true that there's no paper, one needs to look at digital as connected information accelerating the product development process.

Q: AND YOU CAN SHARE IT WITH ANYONE IN REAL-TIME?

A: If you're in the USA, you can share it with someone in Germany or Taiwan, who can look at it with you at the same time. But now you are sharing the embedded data and knowledge too—that's where the real benefit comes in.

Q: THAT'S PRETTY AWESOME. SO IT REALLY COMES DOWN TO A CONNECTED PROCESS FLOW AND WORK ENVIRONMENT?

A: That's really the essence of digital engineering.

Imagine all the content of a 3D CAD model—its specs, documentation, history and embedded subject matter expertise—from around the world, all within and all together, in an increasingly interconnected creation space. Add to that the ability to look at all of the tooling for the part at the same time along with the power of visualizing the right data at the right time.

If you're an entrepreneur making a new product, you have to machine those parts eventually, but before spending the big money, you can rapid prototype through 3D printing or additive manufacturing processes and deploy many other cost-saving technologies. You can really begin to save time and money by seeing the design come together, before you ever have to spend a nickel on actually going out and building the first prototype.

Q: DO YOU HAVE ANY FAVORITE BOOKS, ARTICLES, OR PAPERS—RELATED TO DIGITAL ENGINEERING—THAT YOU RECOMMEND OUR READERS CHECK OUT?

A: Here's my short list of favorite books:

- *Creative Confidence* by Tom Kelley and David Kelley
- *Makers: The New Industrial Revolution* by Chris Anderson
- *Skunk Works* by Ben Rich

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