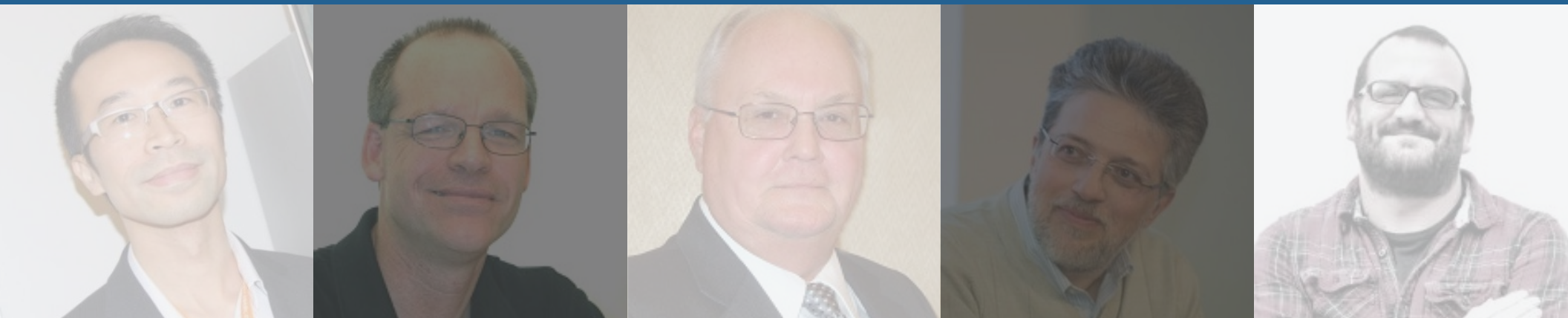


# 10 EXPERT INSIGHTS:

The Future of Product Design in the Age of Smart  
& Connected Devices



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# INTRODUCTION

50 Billion things could be connected to the internet by the end of this decade. That's a four-fold increase in only six short years. What should be expected in the next 6 years?

Luckily, the future of product design is only going to get better. Smarter, more connected products are going to be built, allowing more opportunities for personal, and business growth.

Advances like mixed reality takes this growth one step further by allowing us to interact directly with the environment in which we're creating – in 3D. You can work in 3D in real time. You still want a physical prototype to get a sense for how something feels, but now you can make design decisions earlier.

Using these new technologies with the right strategy, you're able to capitalize on these new opportunities and capture real value. With the right strategic choices alongside embracing the future of product design you can create and sustain competitive advantage.

We've reached out to experts in the industry, to see what they thought the future looked like, and how they were going to begin embracing the change. We encourage you to use these predictions to start preparing for what lies ahead in the product design industry.



MICHELLE BOUCHER

Michelle Boucher is the Vice President of Research for Engineering Software for research firm Tech-Clarity. Michelle has spent over 20 years in various roles in engineering, marketing, management, and as an analyst. She has broad experience with topics such as product design, simulation, systems engineering, mechatronics, embedded systems, PCB design, improving product performance, process improvement, and mass customization. She graduated magna cum laude with an MBA from Babson College and earned a BS in Mechanical Engineering, with distinction, from Worcester Polytechnic Institute.

## New Possibilities with Internet of Things (IoT) Technology

“With IoT, mechanical engineers have the opportunity for product insights that were never possible before. With an IoT enabled product or device, products can stream usage data back to engineers. By applying analytics to this big data, engineers can see how products are used in the field, where customers tend to have problems, and what functions are not used. This can provide an invaluable resource to enable better decisions around product enhancement such as how to improve ease of use, where to make quality improvements, and what innovative ideas will benefit customers the most. With these powerful insights, engineers will be empowered like never before to have a direct impact on the competitiveness of their products.”



KENNETH WONG

Kenneth Wong has been a regular contributor to the CAD industry press since 2000

## Entering into a New World of CAD Design

“The term “mechanical design” is no longer adequate to describe the new breed of products that people design in the era of connected devices. Their primary functions are driven by electronics, software, sensors, and ubiquitous connectivity. They anticipate and predict the user’s needs rather than react to the user’s commands. They have to be both utilitarian and accessory-like, both private and broadcast-capable, both easy to operate and sophisticated in operations. This may prove to be a steep learning curve for those who cannot break out of the classic mechanical mindset.”



ALLAN BEHRENS

Over the past 30 years Allan Behrens's executive and non-executive roles in the IT industry have resulted in a unique accumulation of knowledge encompassing both business and technology. His experience allows him to deliver valued research, advisory services, business insight and thought leadership in many areas; he helps end user companies increase performance by developing practical strategies for effective application of IT and assists IT vendors and their supply channels improve their performance, routes to market and services to their customers. His work experience covers a broad spectrum of roles in end user, IT supplier, channel and analyst and consulting companies, and he was one of the founders of one of the UK's largest engineering solution suppliers.

## Increased Customer Expectations are Leading to Better Technologies

"Driven by increasing expectations on new experiences and value propositions, products and services, both for consumer and commercial customers, are going through dramatic evolutions. This dynamic is driving significant change to the ecosystem of products that develop and deliver today and tomorrows smarter, connected products. What's more interesting perhaps to some, is that this evolution extends beyond 'product' to new propositions that augment (and allow us to potentially replace) legacy 'buy', operate and service models. The tools and services that allow 'creators' to develop, make, monetize and operate their deliverables are becoming more functional, user-friendly, pervasive and smarter. Evolving design, development and service paradigms, often Cloud based, which embed the virtual and the real, for example VR and AR, make these much more practical and will help lead the way. So too will the ability to more easily and efficiently design, model, simulate and service at multiple levels of fidelity through products' lifecycles. This trend applies not only to product constituents, but in the context of the 'product as whole' and the 'product in-use'."



CHAD JACKSON

Chad Jackson is an analyst, researcher and blogger providing insights on technologies and used to design products. As a prolific writer, he has published educational thought leadership topics hundreds of times. As a sought-after speaker, he has presented dozens of times both domestically and internationally. As an astute researcher, he has surveyed thousands of engineering organizations as part of his research studies. As a commonsense co-host of numerous web shows, he has debated and pushed the limits on critical issues. Overall, Chad is an influential, independent and insightful voice on technologies used to design products.

## A More Shocking Technology Change Than Some May Think

“At first glance, I don’t think a lot of engineering leaders realize just how much mechanical design will be affected by the transition from developing mechatronic products to developing IoT enabled products. But there are many different areas that will require adjustments.

Mechanical aspects of products, which can’t be updated like on-board software, will need to be more forward looking than the past. That will enable successive upgrades to the product via a over the air software update and reconfiguration of electronic variables. But smart engineering organizations will also incorporate this into their product strategies.

The requirements horizon for platform design and modularity will shift from just a few months or years out to perhaps decades. Manufacturers need to take this into account. **(Continued on Next Page)**

## A More Shocking Technology Change Than Some May Think (cont'd)

The application of IoT in the design and development process is huge as well. Collecting data from IoT enabled products in the field allow engineers to factually verify assumptions that are the basis of requirements for new products. Using data from connected sensors as inputs to simulations offer more realistic outcomes, allowing engineers to make better design decisions before committing monies to prototypes. Instrumenting prototypes with IoT enabled sensors can provide far more insight into why it failed during testing.

So, again, lots of engineering leaders may think that the IoT side of things doesn't affect the mechanical aspects of product development. But we're already seeing implications in the short term. And I only expect it to accelerate in the coming year or two. "





KATHLEEN MAHER

Kathleen Maher is an experienced analyst tracking content creation and design software. Maher is the Editor-in-Chief of JPR's TechWatch Report, one of the most respected insider reports published today. She is the author of several well received reports including the 3D Modeling and Animation Report, The CAD Report, and also reports on video animation, print, and audio software. She the Editor in Chief of GraphicSpeak, a website covering graphics hardware and software, Contributing Editor for Computer Graphics World, a frequent contributor to Connect Press, and a contributor to the Handbook of Visual Display Technology (2011).

## The Future of Production: Makers, Builders, and Users

"The long promised transformation of the product production pipeline is well underway and it's happening exactly differently than anyone expected or predicted. CAD has been at the center of production for the last 50 years, but the big changes have been coming from the outside in. For instance, the things are that being built are getting connected to the Internet. They're talking to each other, and may have a thing or two to say to the people who own them, and some even talk back to the people who have designed them. On another front, we've been surprised at the way photogrammetry and scanning technologies have enabled some content creation to do an end run around traditional content-creation tools. It's possible to scan, capture, and produce a 3D model without ever drawing a line in a CAD product.

Ironically, the tools at the center, the design tools, the analysis tools, and the communication tools are often still stuck in silos where they are difficult to use and the information created is difficult to share. As software heads to the cloud and is distributed along thousands of processors information will break free and flow freely. It won't stay locked up by software boundaries or in the hands of technologists. The metaphor here is of course of point clouds – points of information, data, and of course, actual pixels describing actual products. As the dots get better connected designers will be better able to understand what their products are doing, and what customers want. ***(Continued on Next Page)***

## The Future of Production: Makers, Builders, and Users (cont'd)

And then customers will be able to do much more for themselves as they define the products they want.

So what comes next? Recently, at a professional visualization conference, I watched a young woman in a VR headset enthusiastically sculpt gorgeous 3D models with her hands. “She’s been coming every day,” I was told. We are gradually seeing technology get out of the way of the people who want to use it. I think the great leap is happening as we stop thinking of creation and communication in linear terms but rather as volumetric clouds – like processors in the network, points in a volume, people in a crowd, and a women crafting her own dreams.”



RICKY LUI

Ricky Lui is the Co-founder of Joy Aether Limited. He has over 15 years experience in software development and project management. For the last 6 years, he has been bringing businesses to the mobile world via many mobile enterprise software solutions. He has also been applying AR (Augmented Reality) technologies on smartphones for many industries to enrich user experience, to deepen engagement, and to entertain. Lui holds a Bachelor in Applied Science & Engineering, and an MBA degree.

## New Technology and Old Tools Working Together

“Designers of AR software and apps will find many of the traditional tools still very useful: e.g. paper and video prototyping, understanding existing mental models, etc. But on top of that, the AR user experience will involve two user interfaces: the software and the visual target. The interplay between these two interfaces will bring on new things to consider, e.g. for an AR app, how far away from, or close to, the visual target will the user experience starts to break down? What’s the difference to ask the user to perform an action by touching the smartphone screen, vs by touching the visual marker? Such interplay will need to be kept in mind while using any tools. As for using AR for design, Service Designers / Experience Designers are increasingly looking into using AR technology to visualize different hypotheses and prototypes, by overlaying virtual embodiments of service design elements onto the real environment. Higher cost is an inhibiting factor in using AR for service design, but for larger scale projects it will be an invaluable tool.”



THOMAS A. GILL

Tom Gill has over 25 years of experience applying computer-based solutions to engineering and manufacturing. Before joining CIMdata he worked as an independent PLM consultant, after spending over 20 years at high-volume manufacturing companies. Mr. Gill led a team that developed and deployed a PLM system to manage engineering and quality processes, and has participated in enterprise system projects including RFQ management, material development, and environmental systems. Mr. Gill holds a BS in Mechanical Engineering from the University of Maine, and is Configuration Management certified.



KEN VERSPRILLE, PH.D.

Dr. Ken Versprille has over 35 years of experience in the application of computer-based solutions for engineering and manufacturing. He joined CIMdata after 16 years heading the Design Creation and Validation service at CPDA/D.H.Brown Associates. During 15 years at Computervision, Dr. Versprille became the equivalent of CTO, and was R&D Vice President of core applications. He was a lead architect of the CADDs 4 product, with responsibility for the initial design of Computervision's 3D graphics system. As General Manager of CV-Doors, he led the group that introduced and managed the CAD industry's first geometric kernel business. Dr. Versprille received a BS in Mathematics from the University of New Hampshire. His MS and Ph.D. in Computer Science are from Syracuse University. Dr. Versprille is recognized for publishing the first description of NURBS, the mathematical curve-and-surface formulation, now an international standard in CAD and Computer Graphics. In 2005 he received a Lifetime Achievement Award from The CAD Society.

## The Future of Mechanical Product Design

“While many proclaim that mechanical computer-aided design (CAD) modeling is now a commodity, CIMdata sees continued evolution of both new geometric aspects that will be accomplished in CAD and how CAD itself is leveraged in the product development process. For instance, expect to see the emergence of modeling...(Continued on Next Page)

## The Future of Mechanical Product Design (cont'd)

...concepts that define components built from flexible materials like rubber and foam. In addition, the evolution of additive manufacturing will drive the need to represent both new materials and sophisticated layering of materials within 3D printing processes.

CIMdata is already seeing a growth in the basic geometric constructs supported in 3D modeling with the re-emergence of tessellated geometry closely integrated with today's current precise geometry structures. Expect the computer-aided engineering (CAE) processes to create more pressure to also support triangular mesh geometry. All the while this is occurring as the modeling techniques of direct modeling and parametric-driven geometry continue to evolve.

The IT infrastructure of cloud computing will enable new approaches for concurrent CAD design and system engineering principles combining mechanical, electrical, and software in product development. With access to many processors parallel computing paradigms are enabled thereby allowing the execution of complex design tasks faster. As cloud-based data sharing and control improves, mechanical design will be able to take on even more complex algorithms.

A new generation of smart products will provide design engineering with practical information on how products are used in the field. Semantic-powered information discovery and analysis will prove a promising technique that can help designers intelligently sift through mounds of data to provide wisdom that will help improve product development, the design of products, and enhance business performance. CIMdata also sees a growing role for both virtual and augmented reality in the way CAD modeling will be both enhanced and leveraged, changing the way products are designed and supported."



OLEG SHILOVITSKY

I'm passionate about using technologies and building businesses that transform the way people work in engineering, manufacturing and enterprise. Newman Cloud is a new business I started in 2016 with a mission to help manufacturing companies conduct more efficient business in 21st century environment. [Beyond PLM](#) is my social brand to share information and comments related to product lifecycle management (PLM), engineering and manufacturing software.

## Product Design, Manufacturing & Emerging Technologies

*"We are in front of a significant technological disruption that will transform manufacturing over the next 3-5 years. The following list of technologies will have a significant impact on the future of product design and engineering."*

### 1- NEW DATA TECHNOLOGIES, IOT AND BIG DATA

*Companies are drowning in an ocean of data. It starts from design information, product, engineering, and manufacturing data but it doesn't stop there. Products themselves are generating lot of information during their lifecycle – and new trends for IoT will bring even more information to manufacturing companies.*

*IoT is going to change the scale of data that modern product development and manufacturing companies are consuming. It is not about managing of documents or even bill of materials. A tremendous amount of data will be collected from connected devices and this can be transformed into consumable information assets. **(Continued on Next Page)***

*IoT is a growing eco-system tightly connected to new type of product – connected devices. Connected devices will be here sooner than later and they will bring a new way to manage object (product) lifecycle. Network of devices reporting data and managed and supported by IoT platforms is a future extended lifecycle.*

### **2- SMALL IS A NEW BIG. NEW MANUFACTURING, HARDWARE STARTUPS AND MASS CUSTOMIZATION**

*The number of young and new manufacturing companies is growing these days. Manufacturing companies need much less funds to start production. Similar to open source software, we can see a large number of new manufacturing firms starting to produce new and innovating products with very low initial cost. The challenge will be to grow and manage product development process.*

*The era of mass production is behind us, the demand for mass customization is here. We can see signs of customizable products everywhere – e-commerce configurators, personalization in apparel industry, individual shoe design, personalization in medical devices etc.*

*At the same time, the opportunity around mass-customization is facing challenges in engineering and manufacturing environments. Mass customization and personal product development is the future. One of the problems to solve in order to make it happen is to integrate engineering and manufacturing environments. The wall between design models and manufacturing product configuration will need to be removed. The first step into that direction is done by cloud CAD / PDM systems today. (Continued on Next Page)*

### 3- AR

*Leading CAD and PLM companies are in full swing to embrace the IoT. Just look around – everything from the thermostat to toothbrush is connected to internet. Every day we can hear about new type of sensors that can be placed everywhere. In parallel with more sensors, the technology that can crunch data from sensors is getting better too. Data flowing from these “Things” creates opportunities to analyze equipment performance and understand their usage to a much deeper level than has ever been possible.*

*Augmented Reality is a new way to interface with Things. AR applications will allow a technician to see this information using different devices. These augmented reality (AR) applications are targeting service industry where the most immediate value can be realized.”*





AL DEAN

Editor-in-chief and co founder DEVELOP3D Magazine

## The Future Practices of Design and The Technology that Supports Them

"I always tend to think about two things when asked about the future of product design - the practice of design and the technology that supports that activity. Taking in all of the changes over the last year or so, looking ahead into where these changes might lead, there are two key things that strike me as representing future directions.

Design is becoming more collaborative: Now. Let's be fundamentally clear here. We're not talking about wholesale changes to how design is done in large, established companies, but rather at the other end of the market, in the start-ups and the skunkworks projects.

Whether it's now due to greater social networking, more prevalent platforms for communication and community connections or simply that folks are becoming less secretive, there's a distinct trend towards more open product development. Designers and engineers of the future aren't afraid to share their work in progress, to seek out help elsewhere and to learn from and teach their peers.

# The Future Practices of Design and The Technology that Supports Them

This doesn't mean that companies are abandoning protection of their intellectual property protection practices - it means that things aren't quite as secretive as they might once have been. Whether it's Tesla opening on their patent portfolio or crowd funding companies doing their work in the public eye, there's a definite sea change happening.

Technology will be more immersive: We're mostly all aware of the current hype surround virtual and augmented reality. While this will continue for a good few years to come (and god knows, there's enough funding available to do that till the end of time), eventually it will settle into a useful set of tools that those engaging in product design will be able to take advantage of.

The current status quo is a flat screen with vaguely accurate 3D renderings built into your design system. While the mechanics of that mean that this will always be the majority of your working days and interaction with designs as they progress, we'll soon have a more immersive set of tools that afford us greater interaction with products in development. Examples might be strapping on a VR headset for a walk around your product iteration or an augmented reality headset that gives insight into that same product in the context of the real world."



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[Learn more in this short video](#)