Secrets to Success in the Hot IoT Space

Discover How PLM Unlocks the Imagination of Top IoT Companies

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How the IoT Market Will Change Product Design

The “Internet of Things” (IoT) is a term you’ve probably read in the headlines. Analysts, such as IDC, forecast IoT revenues will reach $3 trillion in 2020 with 30 billion devices expected to be connected through the Internet.[1]

IPOs of IoT companies like Fitbit and GoPro, along with Google’s investment in driverless cars and $3.2 billion dollar acquisition of Nest’s smart thermostat system prove the IoT phenomenon is real.

But as the volume of new IoT devices increases, product launch failure rates have scaled way past 50 percent, according to Gartner. This puts hundreds of billions of dollars at stake for electronics manufacturers. With such a high product design failure rate, IoT companies must now ponder these questions:

- How can we manage our design processes or products better?
- Can we monetize aspects of the Internet of Things?
- Where can we use the Internet of Things to embed technologies for remote operation and management of our assets?
- How can we extend our existing products with the Internet of Things?
- What product design and supply chain management tools will best help us succeed?

To help companies become IoT successes, Arena Solutions, the inventor of cloud product lifecycle management (PLM), has published this definitive IoT whitepaper. With input from Arena customers, partners, and top IoT analysts, we share their first-hand insights into the following IoT product design topics:

- Why You Should Care About IoT
- Lessons Learned from the Medical Device IoT Market
- How Cloud PLM Accelerates IoT’s Need for Speed
- How to Turn Disruptive Change Into IoT Innovation
- Why IoT Success Depends Upon a Robust PLM Ecosystem

Here’s what you need to know to unlock your imagination, turn design ideas into product realities and make money in the IoT market.

Why You Should Care About IoT

The Internet of Things is a product design megatrend that is impacting how both new and old companies innovate and turn designs into the next breakthrough. Yet for many electronic product companies on the outside looking in at the potential of the IoT market, one lingering question remains:

What exactly *is* the "Internet of Things"?

If you're still confused about what the "Internet of Things" means and why you should care —you're hardly alone. In fact, nearly half (43%) of the manufacturing executives polled recently by LNS Research said they don't know anything about the IoT market. What's more, only 10% say they've started to invest in IoT technologies.[2]

The concept of "Internet of Things" dates back almost a century. In 1926, Nikola Tesla said, "When wireless is perfectly applied, the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole...and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket."

As a modern working definition, Internet of Things is the advanced connectivity of devices, systems, and services over a variety of protocols, domains, and applications. "Things", in IoT, can refer to a broad array of devices, such as heart monitoring implants, biochip transponders on farm animals, automobiles with built-in sensors or field operation devices that assist firefighters in search and rescue. The interconnection of these embedded devices will usher in omnipresent automation in nearly all fields.

As innovative product designers dream up countless ways to exploit the inherent connectivity that will be offered in intelligent products, you can bet your sensor-covered shorts that an endless universe of new devices will explode upon the market. And as user-oriented computing expands, so will the Internet of Things market.

From a product design perspective, the opportunity is big and the possibilities are endless. Sensors embedded in everything from buildings to vehicles to clothing are solving real life problems. An office that tells you the lights are on, a bike (or a dog) quietly alerts you that its been stolen with its location, dance aerobics shoes that can let you know when they're worn out, and a couch could holler, belch or burp depending upon your downloadable alert tone when it has swallowed your keys.

Imagine how much easier Pee-Wee Herman's quest to find his stolen bike would have been with an IoT solution.

Michael Keer, CEO of Product Realization Group (PRG), a consortium of Silicon Valley experts that helps bring IoT product companies to market, believes the IoT market will impact every aspect of our lives, and transform how we interact with both physical and digital worlds. "From virtual reality to self-driving cars to wearable devices, the opportunities are endless," says Keer. "We are entering a quantified world, so hold on to your IoT hat."

And while Tesla's vision for a "perfectly applied" wireless technology and "simple" tools has not as of yet proven to be totally accurate; there's no doubt that the IoT market has become a viable reality with commercially successful deployments in several markets, ranging from consumer electronics and fitness wearables to medical devices. In the next wave of IoT development, we'll see the aggregation of connected devices propagated into truly smart homes, smart factories, smart grids and smart cities.

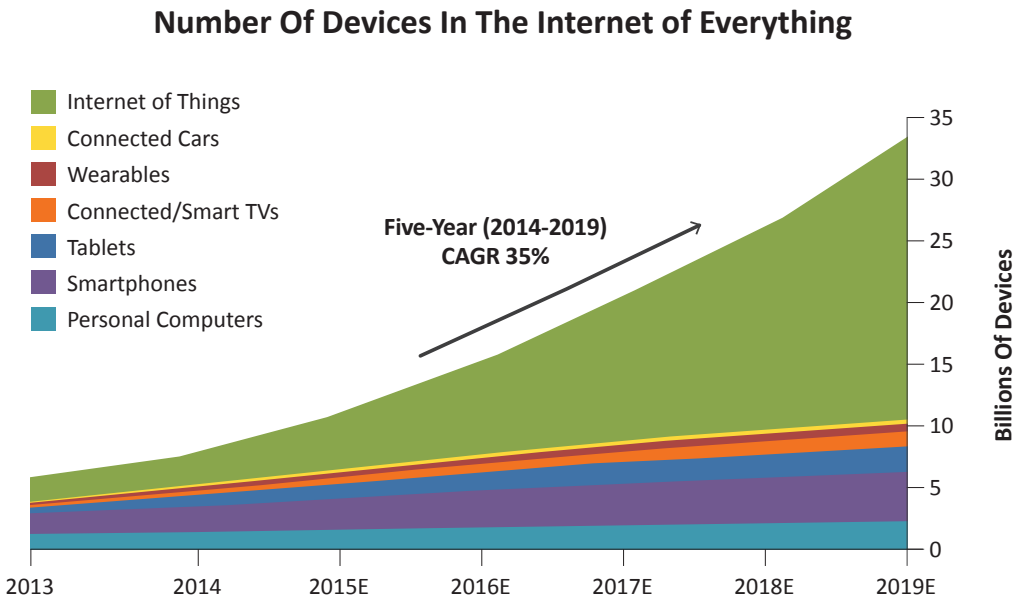
Internet of Things products introduced at Consumer Electronics Show (CES) offer endlessly imaginative solutions, ranging from do-everything wearable devices to a connected tennis racket that records your strokes. Some products inevitable veer into the realm of bizzare with the toothbrush that connects to the Web and records your brushing activity, letting you know when your teeth need a more thorough cleaning.

On the other hand, there are healthcare IoT devices that serve a dead serious medical need.

Lessons Learned from the Medical Device IoT Market

The Internet of Things market includes everything from consumer device (refrigerators, clothes washers, door locks, thermostats, watches, eyeglasses and wearable items) to cars and robots of all kinds; however, health and life sciences are one of the most compelling, yet unheralded, application areas of IoT technology; in fact, the healthcare industry helped pioneer IoT.

All the way back in 2008, a company called Proteus Digital Health won a U.S. patent for a pill you can swallow with a tiny sensor inside of it. The sensor transmits data about when a patient takes his or her medication, and pairs with a wearable device to inform family members if it's not taken at the right time. Anyone else old enough out there to remember the film "Fantastic Voyage"?



Source: BI Intelligence Estimates

With the increasing use of sensors by medical devices, remote and continuous monitoring of a patient's health is becoming possible. This network of sensors, actuators and other real time mobile communication devices, referred to as the Internet of Things for Medical Devices (IoT-MD), is poised to revolutionize the healthcare industry.

A connected healthcare environment promotes the quick flow of information and enables easy access to it. Improved home care facilities and regular health updates to clinicians reduce the chances of redundant or inappropriate care, ensure patient care and safety, and reduce overall costs of care. Connected solutions can also be used to track lifestyle diseases such as hypertension, diabetes and asthma, which need continuous monitoring.

Peter Lucas, the COO of Epic Medical Concepts & Innovations (EMCI), a company that translates scientific research into IoT-ready medical devices, believes the IoT market introduces particularly exciting possibilities in the life sciences industry. Within the medical realm, the interconnection of technology is more useful than highly touted "big data" at identifying trends, improving response times, and locating small problems before they become big problems.

"The idea that our medical devices can communicate with the lab hardware in which they operate in a meaningful, real-time manner is really exciting," says Lucas. "It manifests into improving medical outcomes and finding new breakthroughs, especially for EMCI in the area of cognitive neuroscience."

EMCI's most recent disruptive medical device technologies include systems that track physical patient records to reduce errors and speed retrieval time, as well as report on the status of biological specimens in a hospital setting. "We envision these IoT systems eventually sitting in hospitals all across the country and having the ability to communicate with each other" says Lucas.

IoT-MD will drastically change the face of healthcare monitoring and treatment outcomes. By providing personalized and optimized services, it will promote a better standard of living and provides a timely and cost-effective response to help nations around the world improve patient care. Moreover, recent developments in sensor, internet, cloud, mobility and big data technologies have led to affordable medical devices and connected health programs, vastly increasing the potential to influence further changes.

But IoT-MD design Nirvana is complicated by increasingly stringent regulation and compliance requirements. After all, human lives are at stake.

"It's one thing for your microwave to diagnose itself and call a repair tech; it's another thing entirely to have medical information passing from device to device," says Lucas. "I believe this will be an area that grows quickly, but will result in missteps along the way. I can almost guarantee there will be breaches of patient data, unanticipated consequences, etc. But on the other hand, interconnectivity of this type will also bring about medical innovations that would otherwise never happen."

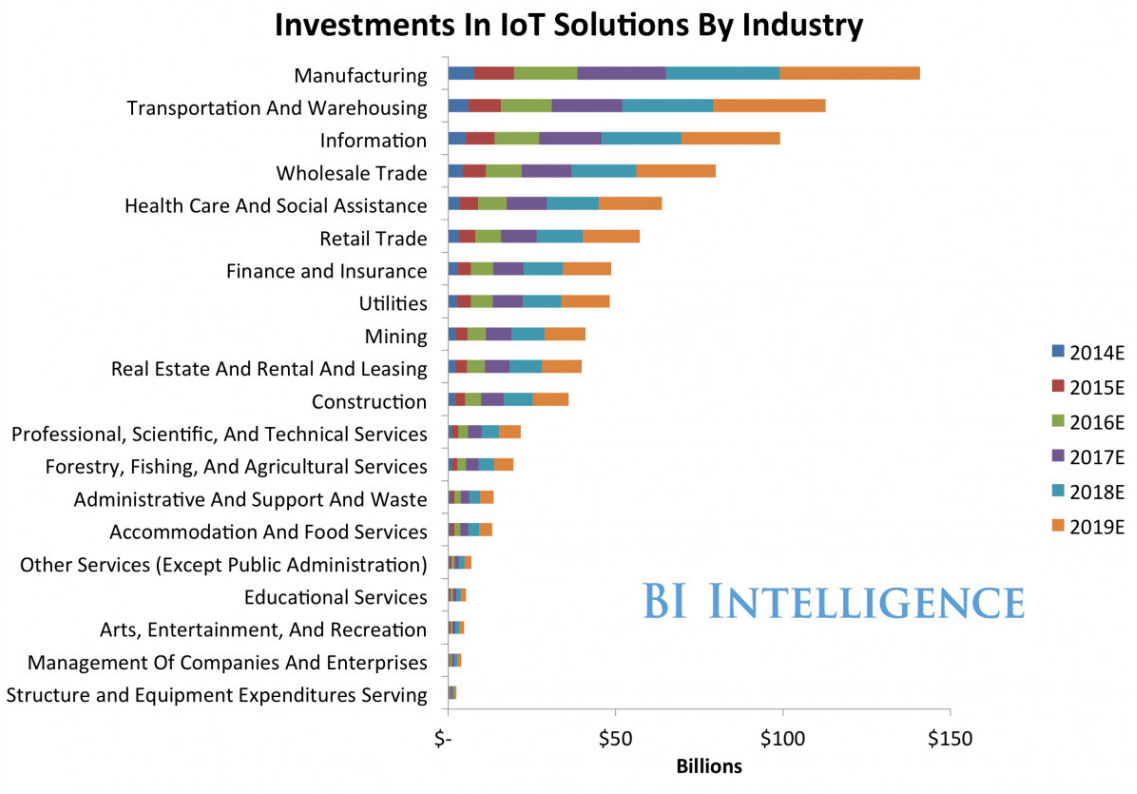
For the IoT-MD market, a modern design solution that consolidates all compliance information, including bill of materials (BOM), the design history file (DHF), and the device master record (DMR), into one centralized system is imperative to meet increasingly stringent regulatory audits. FDA regulations and product quality business processes include: 21 CFR Part 11, 21 CFR Part 820 and CAPA (corrective action and preventive actions).

And true, while compliance challenges are more treacherous in the IoT-MD space than other industries, the need to adopt disruptive change while juggling stringent quality concerns impacts IoT companies of all stripes.

How Cloud PLM Accelerates IoT's Need for Speed

While pain points, regulatory hurdles, and adoption rates can vary widely across industries, one challenge that impacts every IoT company is the critical need to move fast. To ensure first mover advantage in a highly competitive industry, more and more IoT consumer electronics companies rely on a cloud-based product lifecycle management (PLM) solution to innovate while accelerating time to market. This is particularly true when products have complex embedded electronics with a high rate of change.

A critical advantage of cloud PLM systems is that the solutions are maintained by the provider, which means setup is easy and, most importantly, fast. And the flexibility to add and subtract licenses and modules is key to becoming short-listed. On-premise PLM, on the other hand, has an expensive and time-intensive integration process, which requires software licenses and a significant upfront infrastructure investment.



Source: BI Intelligence Estimates

"What I see most often with IoT clients is that they want to get up and running quickly with basic functionality," says Keer. "It's part of the lean startup mentality. And as these companies grow in size and complexity, they need a solution in place that has the cababilities to support them as they scale, without the need to switch during a critical business ramp. Companies don't want to be burdened with the installation, setup, and maintenance of on-premise computer networks anymore."

The speed of disruption is so fast in the IoT space, engineering teams must be rock solid in their delivery. Many failed emerging IoT companies are unable to meet aggressive design and delivery schedules because they did not have the proper tools in place to manage design data to meet their original product delivery estimates.

According to Manny Marcano, president and CEO of EMA, a company that offers a design automation solution for Cadence OrCAD, "A lot of these companies are charging fast to grab a piece of the IoT market. And a lot of times they're starting with a back of the napkin design and a quick prototype to get some VC funding and then they're off to the races," says Marcano.

"Companies in the IoT space are actually rolling out PLM at the same time they are building products and taking orders. So if you have a design solution that can be implemented quickly, without a lot of overhead to get a consumer electronics stamp and FCC approval— that's a big value to them."

For OEMs, the key to moving fast in the rapidly changing IoT market is maintaining rigor, discipline and forward-looking strategies. Successful companies keep abreast of tech developments and make well-researched judgment calls about how and when to pull the trigger and adopt new innovations into a product design; however, companies without the vision and tools to respond to change and adopt new technologies quickly could lose the razor's edge in this competitive high tech market.

Innovation is the holy grail of many product companies as they seek to differentiate their products from those of competitors. Integration of quality processes into the design cycle through collaborative quality tools can give companies the competitive edge they seek. All it takes is a shift in thinking, a willingness to embrace user feedback, and a methodology to drive quality into the product development process.

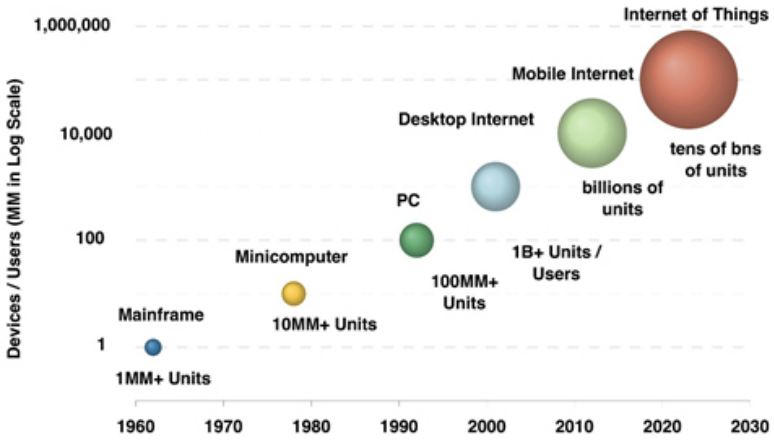


Figure 1. More Connected Devices on the Planet Today Than People
Source: Silicon Labs. Thomson Reuters, Morgan Stanley

How to Turn Disruptive Change Into IoT Innovation

Change happens fast and manufacturers must react quickly to embrace it. New technological developments impact product design and require OEMs to have the tools in place to streamline design processes.

By minimizing costly product errors and shipping delays — especially for a sector with complex products and frequently changing parts, such as batteries —a cloud PLM solution helps companies get to market first, stake a larger market share, and maximize profit margins.

"Some of the biggest disruptions in IoT products are changes in electronic components. Sensors, controllers, and batteries are all rapidly evolving to better support new applications like wearables that need smaller and lower power consuming parts," says Keer. "After all, you wouldn't want to buy a smart watch that weighs 10 lbs and runs out of juice in 4 hours."

PLM helps OEMs plan with the flexibility to be agile, make changes quickly and implement based upon supply chain issues, tech advances, competition and consumer demand.

According to Keer, a cloud-based PLM solution is critical to keep track of these electronic components. A better understanding of which parts are going obsolete can provide a competitive edge for IoT companies. A strong PLM system enables the successful execution of a technology pivot, facilitates a contract manufacturer switch, and accelerates a new product launch.

"As engineers collect components, operations would be adding those components into Arena PLM. They then can figure out lead-time for each component, which impacts time to market," says Keer. "So if an engineer selects a component that has a two-month lead-time, operations may say, here's an alternative part, which has a one-week lead time. This example drops straight to the bottom-line of time savings on their critical path which has a direct correlation with collapsing time to market."

Gartner predicts that one in five vehicles on the road will have some form of wireless connection by 2020. Mercedes-Benz already has a partnership with Nest that adjusts the temperature when a driver arrives or leaves home. And it's really good news for Arena Solutions customer Sierra Wireless, which already has Ford, BMW, Tesla, Volvo, and Toyota as customers.

Most new IoT companies have global design and supply chains, which afford them greater flexibility during development and the ability to scale quickly as volumes ramp. Strong collaboration and management tools to support these global chains are now a must-have for these businesses. The old bootstrap combination of Microsoft Excel, DropBox, Google, etc. are too risky as these business move from idea to scale.

IoT companies we interviewed unanimously concurred that a cloud-based PLM system offers OEMs the flexibility to be nimble, make changes quickly and implement based on supply chain issues, tech advances, competition and consumer demand. The overwhelming consensus is that on-premise PLM simply cannot provide these benefits.

Note: Sierra Wireless, a leading developer of industry-leading wireless PC card lines for portable computers, turned to Arena to reduce ECOs and streamline processes. "With Arena, it's easy to track product changes, and the amount of work we are able to achieve with Arena is unbelievable," says Sierra Wireless.

Why IoT Success Depends Upon a PLM Ecosystem

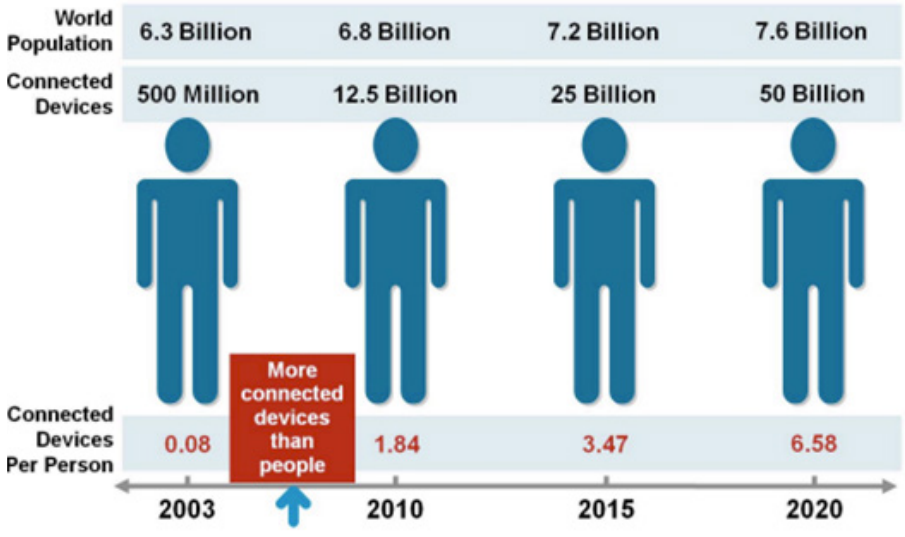
The only way to manage the IoT product lifecycle – from regulatory compliance, to global monitoring, quality assurance, risk management and part nonconformance – is through a holistic approach that brings all of these moving parts together into a single, integrated view. When quality, design control processes, and risk management are embedded as an integral part of the day-to-day product design and development cycle, OEMs can dramatically reduce supply chain oversights, employee missteps and product design errors.

"A lot of these IoT companies are growing very quickly and are looking for a 'one-size fits all,' off-the-shelf, plug-and-play environment," says Marcano. "Because Arena and EMA are working together, we're able to address that need on the electrical side and the PLM side, so we can get them up and running in a matter of hours, in some cases."

A highly integrated and robust design system is imperative to address hurdles, such as obsolescence, single-sourced components, regulation compliance, and market availability of electronic components. Arena's suite of interconnected solutions connected with the product record offers a higher level of visibility into design processes to offset the risks of quality failure.

"While Arena was helpful across a broad range of issues, the interconnection between Arena PLM BOMControl and Arena Quality is where the value really shows itself," says Lucas. "We know when we change a specification on one part of one of our devices, immediately what other parts, products, procedures, and manufacturing processes are affected. We can jump straight from there into engineering and document change requests and orders, as those can interconnect with our CAPA process within Arena Quality."

An IoT company with design tools that can store, control, and communicate their product data across global design and supply chains will help overcome design challenges, such as security, compliance and corralling disruptive change.



Source: Cisco IBSG, April 2011

"The need for product design tools has always been there, but now it's increased because of the ubiquity of IoT products that will scale even more in the next five years," says Kevin Rowett, Director of Graphite Systems, which makes unified data analysis products. "IoT electronics will now be in products that previously did not have components. In five years, a refrigerator that doesn't report its temperature doesn't make it to market anymore."

He continues, "When it comes to compliance stuff, you better have a design tool that ensures you have the documentation that shows you actually are compliant with these various things. We've learned over the last 20 years that there's a direct correlation between quality and design solutions."

It's an exciting time for product companies. With the right design tools in place they can streamline processes, change directions, and meet demands for new opportunities in this booming market.

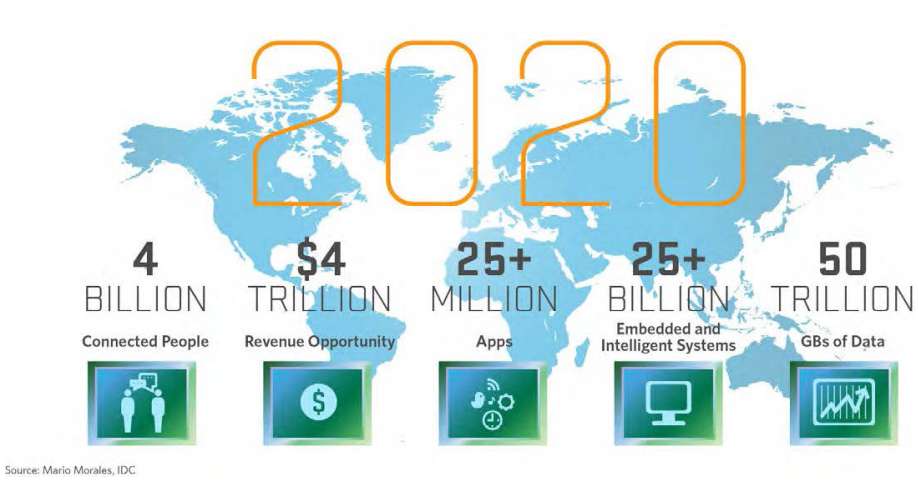
By 2020, the amount of Internet-connected things will reach 50 billion, with $19 trillion in profits and cost savings over the next decade, according to Cisco Systems.[5]

PLM was created to allow all product companies — not just IoT OEMs — to better manage documents to streamline their extended supply chain efficiencies, improve cross-functional collaboration and increase enterprise-wide visibility into the design process. In addition, Arena's PLM applications simplify bill of materials (BOM) and change management for organizations of all sizes, especially IoT companies.

By this very function alone — bolstered by the fact that we're a cloud solution that eliminates setup delays — IoT companies can accelerate time to market with the ability to continuously manage costs, requirements, and design specifications from the early phases of the process.

PLM helps IoT OEMs plan with the flexibility to be agile, make changes quickly and implement based on supply chain issues, tech advances, competition and consumer demand. By minimizing costly product errors and shipping delays — especially for a sector with frequently changing parts — Arena's PLM solution helps IoT companies get to market first, stake out a larger market share, and maximize profit margins.

And that's why over 100 innovative IoT companies (Fitbit, Pebble, GoPro) rely on Arena to unlock their imagination, speed innovation, and tame even the most unconventional design ideas into the IoT's next big thing.



Source: Mario Morales, IDC

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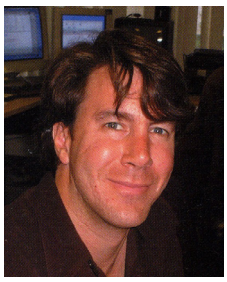
About Arena

Arena pioneered cloud PLM applications. The company's products, including BOMControl, Exchange, and PartsList, enable engineering and manufacturing teams and their extended supply chains to speed prototyping, reduce scrap, and streamline supply chain management. Arena cloud PLM applications simplify bill of materials and change management for companies of all sizes, and offer the right balance of flexibility and control at every point in the product lifecycle—from prototype to full-scale production. Based in Foster City, Calif., Arena has been ranked as a Top 10 PLM solution and also holds a spot on the *San Francisco Business Times'* Best Places to Work List for 2013.



Author

John Papageorge, the author of "Secrets to Success in the Hot IoT Space," has worked with some of the biggest names in technology, including Oracle, IBM, Hewlett Packard, Cisco and Silicon Valley Bank, to analyze and communicate emerging business and technology trends.

Contact

Arena Solutions
Foster City, CA 94404
P. 650.513.3500
F. 650.513.3511

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