

3D Printing: Trends, Strategy, and Application Tactics

An eBook Written by:
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Introduction

3D printing has not only transformed the way we manufacture products, it's transformed the manufacturing process. Prototyping products can be timely and costly. What once involved numerous departments and countless man-hours can now be done by one engineer and the click of a button.

As a leader in product development strategy and technology, we knew we couldn't afford to be complacent as the additive manufacturing industry escalated. 3D Printing is a transformative technology that is changing the way organizations approach product development. It enables rapid prototyping of new products, reiteration of product design, and inexpensive low-volume manufacturing. It has revolutionized the product development process.

This eBook pulls together observations from EAC's thought leaders and information from sources we've determined to be accurate, valuable, and relevant to the 3D printing conversation. We will dissect the trends we have noticed, unpack a strategy to increase the impact of 3D printing, and review what to consider before applying it to your organization.



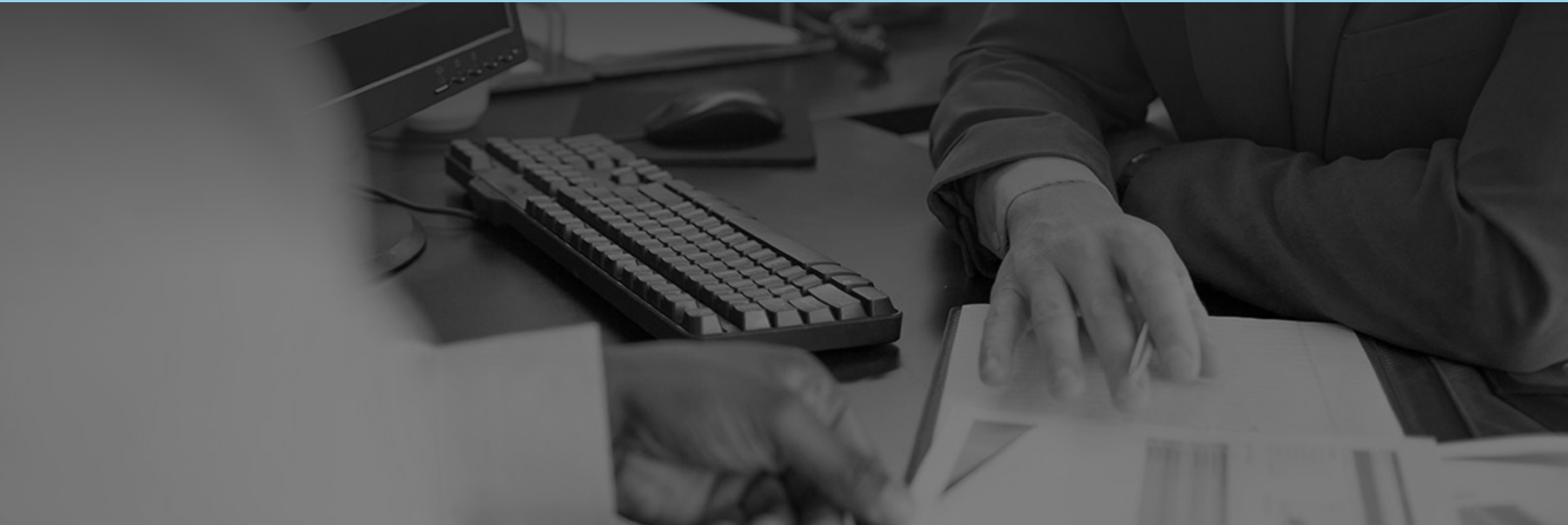
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Trends

We've noticed a variety of trends related to the growth of the 3D printing industry. Executives are seeing the technology's potential and opening their checkbooks to invest. Engineers and designers are accelerating product development, becoming increasingly familiar with the materials and technology, and eagerly looking to the future.

1. Increased Spending
2. Strategic Clarity
3. Popular Materials and Technology
4. Profession and Education



Increased Spending

People are becoming increasingly open to 3D printing and more confident in adding it to their manufacturing process. Organizations are capitalizing on 3D printing's ability to produce objects with increased geometric complexity, reduce time to market, and reduce tooling and assembly costs (McKinsey & Company, 4).

Organizations have realized they can't afford to be complacent. If they expect to reap the benefits of innovation, budget increases are necessary. Organizations are increasing their spending year-over-year on 3D printing. In 2014 the average budget for 3D printing was \$3,736, by 2015, the average budget was \$6,132. It's predicted in 2017, the average budget will increase by 77% (Sculpteo, 4).

Organizations are beginning to feel more comfortable taking risks. Largely because the risk is becoming less and less as quality increases and price decreases. For example, companies like Formlabs, MarkForged, and LulzBot are producing high quality printers for a fraction of what these technologies used to cost. The financial risk required to introduce your organization to this new technology is far less than it used to be. This may be why organizations are increasing their investment in these technologies and seem to be more confident and willing to take the plunge into the world of 3D printing and additive manufacturing.

Strategic Clarity

Manufacturers have typically lacked awareness of 3D printing's relevance to their business. They were unprepared to integrate 3D printing throughout their organization, unable to identify opportunities, and lacked a strategy to work through these objections (McKinsey & Company, 1).

We've found that users are considering how 3D printing can be applied to their organization's processes and/or projects. They have also reported 3D printing is expanding the scope of application within their organization as they use it to support decision-making. In 2016, 93% of people considered 3D printing a competitive and strategic advantage (Sculpteo, 4).

Some of the factors helping organizations to determine whether or not they want to adopt 3D printing include: material and supply costs, machine consistency and capabilities, reverse engineering, understanding their customers needs, and training teams (Sculpteo, 5). Machine capabilities, printed parts consistency, and supply/materials costs are crucial factors to consider if you are looking to save production time in 3D printing as well.

As organizations develop a strategy for 3D printing, they are realizing the benefits are not capped at innovation. They expand much further into entirely new industries they may not have entered without leveraging 3D printing as a competitive advantage.

Popular Materials and Technology

The primary uses of 3D printing include prototyping, proof of concept, and production. The most popular 3D printing material is plastic. This is largely because it is the cheapest to produce. It's also one of the top applications because it is the most used material in prototyping.

Some other 3D printing materials include resins, metals, multicolor/sandstone, ceramics, and wax. In coming years, users are hoping for more functional and higher quality materials (Sculpteo, 6).

The 'right' or 'proper' material for any 3D print depends on how the printed part will be used. While materials are an indicator of the evolution of 3D printing, the technology used indicates printing objectives. The top 3D printing technologies in 2016 were Selective Laser Sintering (SLS), Fused Deposition Modeling (FDM), and Stereolithography (SLA).

Other widely used 3D printing technologies include Multijet/Polyjet, Digital Light Processing (DLP), Direct Metal Laser Sintering (DMLS), Selective Deposition Lamination (SDL), Binder Jetting, Electron Beam Melting (EBM), and Laminated Object Manufacturing (LOM) (Sculpteo, 6).

Top 3D Printing Materials

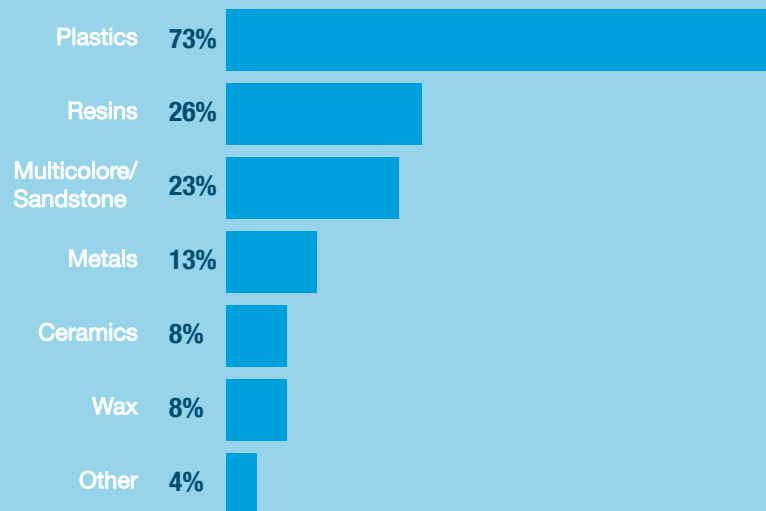


Figure 1. Data provided by Sculpteo, The State of 3D Printing (Sculpteo, 6).

Top 3D Printing Technologies

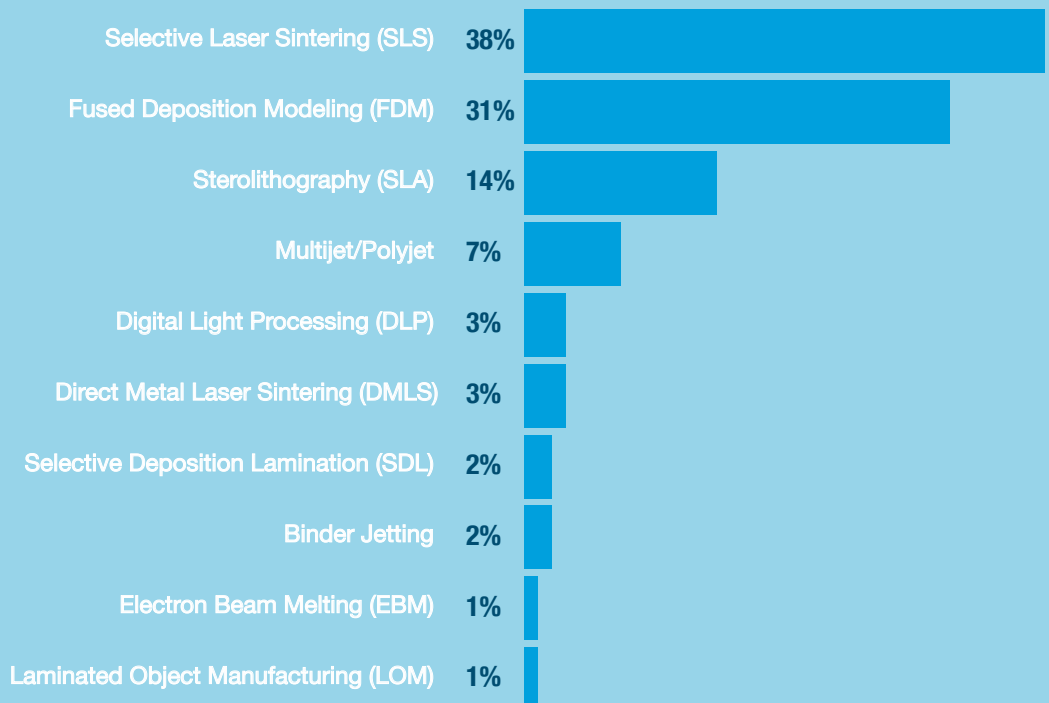


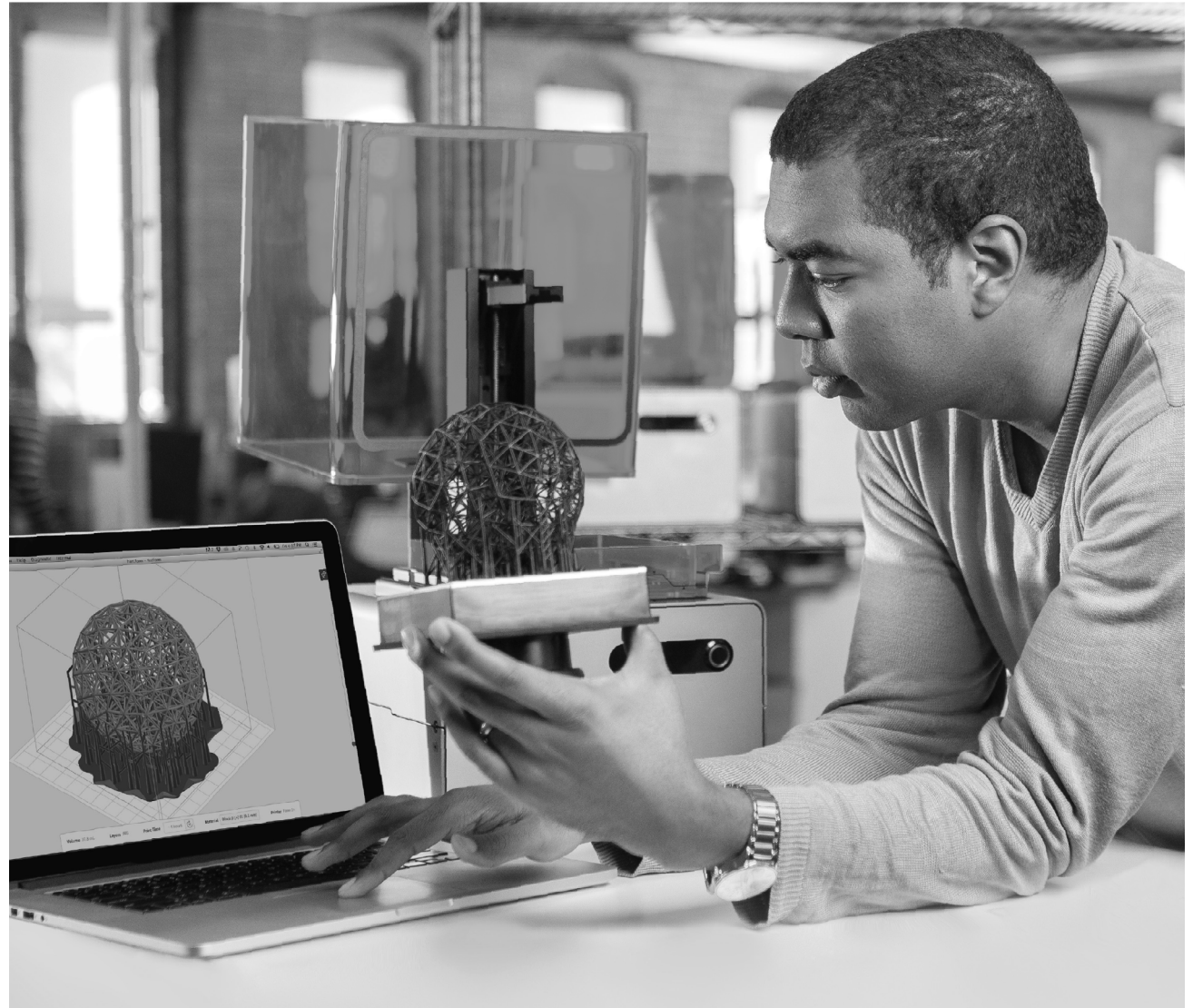
Figure 2. Data provided by Sculpteo, The State of 3D Printing (Sculpteo, 6).

Profession and Education

As 3D printing has transformed from a hobbyists technology to a profession of its own, user's skills have increased. Users have identified themselves in three categories, beginners (23%), intermediates (43%), and experts (31%) (Sculpteo, 7). As the quality of 3D printing gradually improves, the quality of their designs must follow suit. Prints have become increasingly detailed and users must create extremely detailed and well constructed design files.

The need for a 3D printing professional in companies is growing too. It's been reported that 11% of companies who were not using 3D printing previously are likely to open new positions in their organization aligned to a 3D printing professional (Sculpteo 7).

Users have realized the growing need for education in this industry. Like any profession, personal development is important. In it's current state, the 3D printing industry is mostly self-taught. Most users teach themselves the technology and techniques through a process that requires failure. This can be a costly development path that many commercial companies may be reluctant to embrace. Professional training groups will likely capitalize on this burgeoning market and begin to offer formal education for 3D printing and additive manufacturing professionals.



Strategy

Introducing 3D printing to your organization can require an incredible amount of change to processes, quality-assurance, and organizational structure. Developing a strategy that disrupts your organization in a positive manner can be tricky. When developing a 3D printing strategy consider how your product offering can be improved, what organizational processes can be improved, the strategic implications of integrating 3D printing in your organization (Harvard Business Review, 3), and who will champion the strategy.

Improve Product Offering

3D printing will transform the way your organization develops products. It can be a differentiating factor among your products and even your competitors as it allows for limitless customization and efficient production.

Organizations revealed their top priorities in 2016 in a survey published by Sculpteo. What topped the list? Accelerating product development, offering customized products and limited series, increasing production flexibility, buying a 3D printer, optimizing demo expenses, reducing tooling investment, enabling co-creation, and improving spare parts management (Sculpteo, 13). This helps us better understand where organization's priorities lie within the 3D printing industry.

Additionally, products can be improved through the appropriate selection of material for impact resistance, durability, and strength. The shape, size, and color of a product can now be completely customized (Harvard Business Review 7). Low-volume manufacturing allows products to be continuously updated and improved based on customer feedback and trends in the market.

Top 3D Printing Priorities

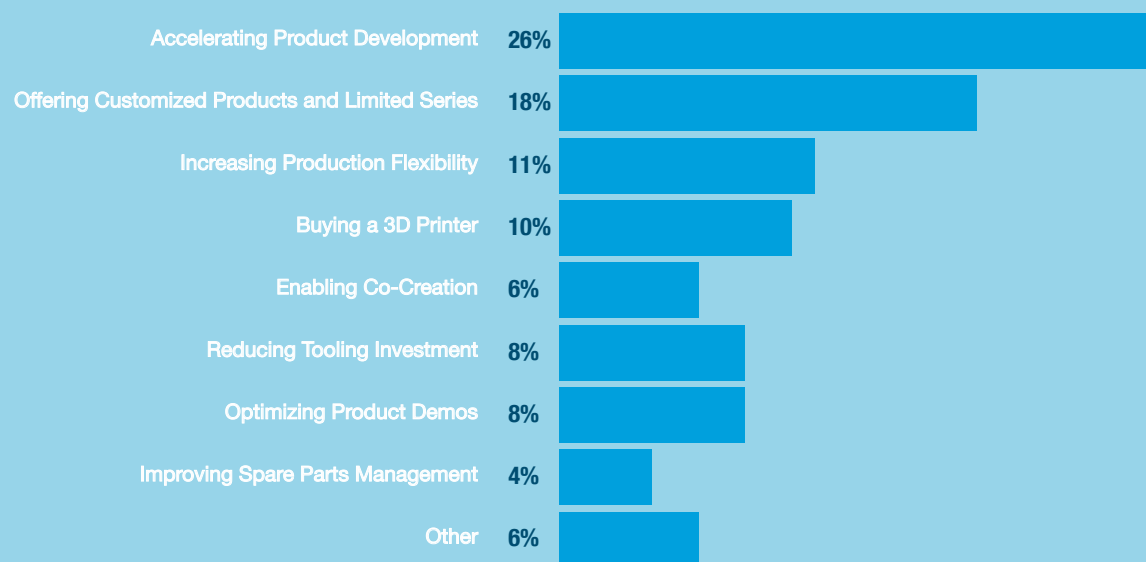


Figure 3. Data provided by Sculpteo, The State of 3D Printing (Sculpteo, 13).

Organizational Process Improvement

Experts believe that over time 3D printing will displace today's standard manufacturing techniques. 3D printing provides flexibility and complete customization. Setting up a 3D print is much simpler and involves far less steps than standard manufacturing. It can save organizations time and money in comparison to standard manufacturing techniques.

Before changing processes, an organization must understand how they buy, create, move, and sell their products. This is necessary to evaluate how 3D printing can replace or improve steps. Another thing to consider is where your organization will house its 3D printers. Consider travel distance and how near or far they should be from the manufacturing floor.

Implementation Strategy

Implementing 3D printing in your organization will cause a disruption. It's a matter how big or small of a disruption you are willing to accept and how quickly you want to make it. Will 3D printing be integrated into your entire value chain or only specific departments? Define the breadth of the impact you want to make.

There have been three waves of technological advancements in 3D printing. The first wave enabled activities such as design-to-print, design sharing, and quick downloads. The second wave coordinated printer operations, quality, capacity exchanges, and network optimization. The third wave is establishing standards to coordinate a complex ecosystem in response to market demands (Harvard Business Review, 3).

It's vital to understand what type of 3D printer you are working with. Understand its build volume, layer thickness, mechanics, materials available for use, and connectivity. The ecosystem you select will impact how users engage with it and how quickly they adopt the technology.

Internal Champion

Executives in your organization should focus on improving internal cohesion and hiring the necessary technical expertise. As the 3D printing industry continues to grow, it's important to have a 3D printing champion within your organization or even in each applicable department. The champion that represents your organization or department should be involved in carrying out and enforcing the organizations 3D printing strategy.

On a scale of beginner, intermediate, or expert - the champion should fall within the intermediate or expert categories. It's important they fully understand the features and benefits of 3D printing so they can teach others in the organization. The champion should be competent in creating 3D files and selecting the appropriate materials for 3D printing. Their goals should include seeking competitive advantages, accelerating product development, and achieving a positive return on investment (ROI) (Sculpteo, 11-14).

Organizations are driving growth with 3D printing. It's becoming critical to adopt this technology to maintain a competitive advantage. Aligning your strategy with a 3D printing champion will ease disruption and increase the rate of adoption and return.



Conclusion

3D printing accelerates product development and saves production time. Designers and engineers are now able to create a 3D model and print it within hours instead of days, weeks, or even months.

In coming years we believe there will be grand leaps in 3D printing innovation, efficiency, and democratization. Expect to see a multitude of new materials and techniques. It's not only about how we are printing, it's about what we are printing. Users are looking for efficiency. They want faster print speeds, faster delivery time, and increased quality and detail in printed parts. Democratization refers to the 'user friendly' aspect of 3D printing. Users require simple and intuitive user interfaces (UI) that are easy enough for everyone to use. The democratization of 3D printing has already begun, but you can expect significant leaps in making it accessible and understandable for everyone, not just engineers.

We've reviewed what's trending and what to consider when developing a strategy, the next step involves integrating 3D printing in your organization. Position your organization in such a way that welcomes new opportunities and challenges as they arise. Don't underestimate what 3D printing can do to your organization. Think of 3D printing as an investment and watch it transform your organizations product development process.

We'd love to talk to you about your 3D printing initiatives, endeavors, and success stories. Tell us how you are adopting 3D printing in your organization on Facebook, LinkedIn, or Twitter!

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About EAC:

For more than 20 years, EAC Product Development Solutions has been transforming the way companies design, manufacture, connect to, and service their products. We work with companies to develop strategies, select solutions and platforms, implement enterprise and user toolsets, and adopt the solutions and ideas necessary to innovate, optimize, and win in the complex and competitive world of product development.

Connect with us to learn more



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