U.S. House Energy & Commerce Committee
Subcommittee on Commerce, Manufacturing, and Trade
Hearing on AI in Manufacturing: Securing American Leadership in Manufacturing and the Next
Generation of Technologies
February 12, 2025

Testimony of Jeff Kinder, Executive Vice President, Product Development and Manufacturing
Solutions, Autodesk, Inc.

Thank you, Chairman Bilirakis and Ranking Member Schakowsky, for holding a hearing on this

important, timely topic and inviting me to testify today.

My name is Jeff Kinder, Executive Vice President of Design and Manufacturing at Autodesk, where I

oversee our manufacturing business. I grew up in Indiana, hailing from a family of firemen,

policemen, and factory workers. After studying engineering in college on an ROTC scholarship, I had

the honor to start my career in the U.S. Navy as a Navigator, as well as Gunnery and Missiles Officer,

on the guided missile cruiser, USS Texas.

After deciding to pursue an MBA, my career led me into business strategy and operations, product

development, and most relevant for today, digital transformation. Transformations have been

hitting industries since the mass adoption of the internet. And over the course of my career, I've had

the privilege of guiding companies in a variety of industries – hospitality, e-commerce, and banking,

to name a few – through digital transformations.

All these transformations have something in common: they seek to leverage the latest technologies

to solve customer pain points and create competitive advantage. What's currently happening in the

manufacturing industry is no exception.

INTRODUCTION TO AUTODESK

At Autodesk, we have a long history of providing innovative software solutions that enable our

customers to design and make a better world for all. From the buildings we live and work in, to the

cars we drive, to the movies we watch in theaters, chances are you engage with the outputs of our software every day.

Autodesk technology serves three primary industries – Design & Manufacturing; Architecture, Engineering, Construction, & Operations; and Media & Entertainment. We are an American company headquartered and founded in the United States in the 1980s. We've been a part of many technological transformations – from PC to web to mobile to cloud, and now artificial intelligence (AI).

Autodesk uses the power of the cloud, AI, and other innovative technologies to give our customers increasingly powerful software tools that enable them to save time and money, reduce waste, enable better decision making, and train their workforces. In effect, these tools promote innovation and make our customers more competitive.

Autodesk has served the manufacturing industry, starting with computer aided design (CAD) software products like AutoCAD mechanical and electrical, for more than three decades. Manufacturing is competitive – both in the US and globally. We know firms large and small are continually looking for the latest technology to give them an edge over the competition. Autodesk helps provide them that edge.

OVERVIEW OF THE MANUFACTURING INDUSTRY – CHALLENGES, OPPORTUNITIES

As the Members of this Committee know, it is a highly dynamic time in the manufacturing industry. The pandemic exposed weaknesses across the manufacturing ecosystem. Manufacturers had to realign and reimagine their supply chains in real time, while simultaneously learning how to harden themselves against future shocks. Significant disruptions caused shortages of raw materials and finished products, including essential goods.

The post-pandemic years have been filled with other challenges that tested the resiliency of manufacturers. Inflation increased costs for an industry that operates on tight margins. The

evolving geopolitical environment has exposed additional risks. A confluence of factors, like demographic shifts and an aging workforce, alongside the rise of new technologies, have created a significant shortage in labor and skills. And yet, demand for products continues to expand, due to the growing global population and increased interest in high-quality, customized products. In short, the U.S. manufacturing industry has a capacity problem – not enough resources, labor, and time to meet demand.

Mix all these factors together and it's clear, while the opportunity is tangible, there are challenges to realizing the dream of expanding and making American manufacturing the most prolific in the world. The good news is we have a solution available to us: digital transformation. To remain competitive, the manufacturing industry has accelerated its digital transformation[1], which offers many benefits, including:

- **Increased efficiency and productivity:** McKinsey reports that digital transformation can reduce machine downtime by 30 to 50 percent and increase labor productivity anywhere from 15 to 30 percent[2].

- **Reduced costs without sacrificing quality:** PwC reports that companies anticipate a nearly 4 percent cost savings over a five-year period due to digital technologies, alongside improved product quality[3].

- **Provide competitive advantage:** Digital tools streamline the product design and development process, automate non-value-additive tasks, and provide critical insights into operations – leading to faster time to market and improved competitiveness.

---

[1] https://www2.deloitte.com/us/en/insights/industry/manufacturing/manufacturing-industry-outlook.html
[2] https://www.mckinsey.com/capabilities/operations/our-insights/capturing-the-true-value-of-industry-four-point-zero
[3] https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf

Manufacturers know digital tools and technology are necessary to remain competitive but *executing* a transformation can be challenging – it is complex, time-intensive, and requires new skills as well as investment.

While new software may be affordable and more powerful, switching costs are high. Small and medium-sized (SME) manufacturers have many barriers to new technology adoption. They may have old, outdated machinery. Skilled labor is scarce. Their margins are incredibly narrow. Often, they are unaware of how digital technologies can improve their processes and productivity. Even when they are aware of new technologies, they don't always have the resources to invest.

Historically, cutting-edge manufacturing technologies have advantaged larger, often global companies that can afford expensive teams of engineers and customized systems to gain economies of scale.

At Autodesk, we are democratizing cutting-edge technology by offering manufacturers the same advanced capabilities at a fraction of the cost. We believe empowering SME manufacturers with technology is the key to unleashing a new renaissance of American manufacturing. A healthy and robust ecosystem of SME manufacturers not only supports good-paying jobs; it also supports supply chain resiliency and flexibility – which ultimately contributes to U.S. economic and national security.

Sustaining the strength of American manufacturing requires a relentless focus on innovation and productivity to remain competitive in our current macroeconomic environment. Empowering manufacturing workers with increasingly powerful technology, such as AI, is the way to do this. Manufacturers are ready. They are eager to stay ahead of global competition and willing to adopt digital capabilities – including AI – that make them more productive. It is in our national interest to help them get there.

AI IN MANUFACTURING

Embracing digital transformation in manufacturing is key to increasing competitiveness. Our customers see AI as an important next step, with the potential to dramatically accelerate the industry's ability to manage product complexity, supply chain chaos, and labor shortages while increasing innovation and output.

Autodesk started investing in AI research over 10 years ago because we knew that's where the industry was heading. Autodesk has a Research team, including an AI Lab, which is the world's leading publisher of peer-reviewed original research on generative AI models trained for creating digital representation of physical products – also known as computer aided design (CAD). Our team of research scientists is dedicated to advancing artificial intelligence research, with the ultimate goal of giving our customers tools to help them design, simulate, build, and manufacture with more innovation and efficiency.

Autodesk is focused on developing concrete AI capabilities that help product designers and manufacturers do their work more effectively and efficiently. Specifically, we aim to reduce the repetitive tasks that traditionally require tedious manual work or significant overhead, address key pain points in the manufacturing process, minimize error, and free up more time for creative work and innovation. More importantly, our AI facilitates improved decision making at all points in the product development and manufacturing process. As supply chains get more complex and production cycles get shorter, our AI augments the decision making of human experts by factoring in the many variables from available material, labor, manufacturing technologies, and supply chain options, to name a few. This translates to improved global competitiveness for manufacturers.

Here are examples of how Autodesk AI is driving practical benefits for the manufacturing industry:

- **Enhancing the creative design process.** We incorporate AI capabilities into our manufacturing design tools that help product designers quickly generate a wide range of design alternatives based on defined parameters, such as materials, manufacturing methods, performance requirements, and cost. This approach can result in innovative designs, efficient use of materials, and significant time savings. Designers and engineers input design goals and parameters, and the software can generate a number of design alternatives that meet these criteria. The product designer then works with these design options to refine them and determine which are best for the needs of a particular project. For example, in auto racing, every second counts and safety is a priority. The North Carolina-based Stewart-Haas racing team used AI-enabled design[4] to reduce weight in the brake pedal on Cole Custer's #41 Mustang. The resulting pedal was 32% lighter and 50% stiffer than the previous part, helping to lightweight the vehicle and make it faster without reducing safety. Cole Custer was the 2023 NASCAR Xfinity Series champion.

- **Reducing time spent on tedious low-value tasks.** Manufacturers design products in 3D but need to translate their work into 2D manufacturing documentation for production. Traditionally, skilled engineers spend as much as 40% of their time doing this documentation work manually. It's a tedious process. Automating this leads to a massive improvement in efficiency. With Autodesk AI, they can now hit a button and create those 2D drawings with radical time savings for customers, freeing up time for more productive, creative work. The adoption numbers show this tool has been incredibly useful to manufacturers – we have generated more than 9 million dimensions in product designs since introducing this feature less than a year ago. That translates to a new dimension being automatically generated every 2 seconds.

---

[4] https://www.youtube.com/watch?v=9iibf3I-7Ho

Another example of this is the process of adding constraints to product designs. These constraints provide parameters to ensure the design intent remains intact. For example, when designing a table, it's necessary to specify that the legs of that table need to remain at the corners, even if the width or length of the table is changed as part of the design process. Autodesk has developed AI technology to automatically apply these constraints as a designer works, dramatically increasing their productivity over the traditional manual process. This is analogous to autocomplete, spell-checking, and grammar-checking in a text-based application. This is another use of AI in manufacturing that provides major productivity gains, enabling designers and engineers to increase their focus on developing new and innovative concepts.

- **Accelerating time to production.** Computer numerical control (CNC) machines are automated manufacturing machines that perform precise and complex operations such as cutting, milling, and drilling. CNC programmers can spend hours or even days manually creating instructions or code – known as tool paths – that are used to control these machines. To solve this, Autodesk uses AI to generate machining strategies in one click, saving hundreds of production hours a year. Our AI capabilities "learn" from a manufacturer's processes as well as from specific models, materials, and machines.

DIGITALLY CONNECTED FACTORY SYSTEMS

Factories are also undergoing technological transformation. Too often the focus is on 3D printers and robots, but there's another, unappreciated source of innovation: using digital tools to connect factory systems, data, and machines to improve factory operations. Autodesk has seen firsthand the ways our customers, particularly SME manufacturers, have improved their factory operations and empowered their people to grow the business.

The ultimate vision of a digital factory connects everything and everyone – shop floor, building, infrastructure, suppliers, vendors, workers, and stakeholders – creating an integrated data flow. From that foundation, factory managers can generate actionable insights that maximize productivity across the entire operation while eliminating pain points.

This kind of data is critical to build, train, and use practical AI models.

Digital factories enable manufacturers to visualize their processes and identify bottlenecks by modeling and simulating for a variety of scenarios. Allowing them to adjust the process before production ever begins. This results in improved product development agility and increased capacity for innovation.

For example, a specialized American footwear brand operates a facility in the Midwest to handle shoe repairs and customized order manufacturing. The company uses software – almost like an operating system for your computer – to manage the factory holistically from raw material ordering to inventory management, maintenance, and managing assets to production. Before, tracking quality control information would require taking all the pieces of paper off the production floor, entering them into a spreadsheet, doing the calculations, and adding up the totals. Imagine: the team can now easily visualize and seamlessly communicate production status, machine outages, quality, productivity, and more. The result: rework on products decreased 54% and productivity is up 29%.

Using digital tools and AI to improve factory operations helps empower manufacturers and their workers to be more productive. When considering how to strengthen American manufacturing and expand factories nationwide, especially for small and mid-sized businesses, it's crucial to explore how AI and digitally connected factory systems can boost productivity and competitiveness.

Of course, the most important component of any successful manufacturing business is its employees, which is why Autodesk invests in people through education and training tools.

EDUCATION AND SKILLS TRAINING

At the beginning of 2024, the U.S. Chamber of Commerce identified that durable goods manufacturing was facing 622,000 unfilled jobs[5]. Over the next three to five years this will be compounded as many manufacturers will face an employee turnover rate of more than 10 percent, simply due to retirement.

To support our customers' skills and talent needs, we provide free access to a large sampling of Autodesk's portfolio of professional software to students, teachers, and educational institutions. Our software is used in over 19,000 schools nationwide, including community college systems, vocational schools, high schools, and universities. We offer <u>certifications</u> for students and mid-career professionals to upskill in computer aided design (CAD), computer aided manufacturing (CAM), simulation, along with AI-enabled design and AI-based processes. We are also helping millions of Americans – mostly youth – build STEM confidence through project-based learning with Tinkercad, our free web app for 3D design, electronics, and coding.

We are dedicated to equipping students, workers, and educators with the tools and curriculum they need to learn, teach, and master the manufacturing skills of the future. For example, we are working with the University of Florida to establish the world's first ever industrialized construction program. Industrialized construction applies manufacturing processes to construction, helping make it more efficient and affordable[6]. Bringing the efficiencies of manufacturing to the construction process can lead to major time and cost savings for building housing and other major

---

[5] https://www.uschamber.com/workforce/understanding-americas-labor-shortage-the-most-impacted-industries

[6] https://dcp.ufl.edu/news/autodesk-gifts-dcp-hwcoe-1-5-million-for-industrialized-construction-engineering/

building projects. UF students will learn how to reduce housing development costs by 50% while doubling the speed of traditional construction methods.

We have also partnered with Limbitless Solutions, a non-profit organization based at the University of Central Florida, where research staff, affiliated faculty, and more than 50 students are working with Autodesk tools to transform what bionic prosthetics for children will look like in the future[7]. In this case, it's custom, 3D printed bionic arms with built-in electronics. Advanced prosthetic solutions for children with limb differences are often difficult to find and expensive to purchase. But Limbitless Solutions is transforming the possibilities with its goal to create "3D hope."

The ingenuity behind these programs and projects is truly inspiring.

With the acceleration of AI, educators and employers are eager to prepare workers to engage with AI features and tools. There's a popular saying, "AI won't take your job, but someone who can effectively work with it will." We agree. We surveyed our industries and recently published a report on skills in the age of AI[8]. The ability to work with AI was ranked as a top skill by 71% of the respondents in design and manufacturing.

These respondents realize that global competitors are also racing to effectively work with AI and introducing AI into their design and make processes. We believe AI will become an imperative to compete in global manufacturing.

While new technologies can create disruption, they also offer exciting opportunities to attract new talent into the manufacturing workforce. Manufacturing has a reputation for being an industry rooted in traditional, analog processes. The integration of digital technology, AI, and advanced machinery is changing that – offering exciting opportunities to draw talent back to this field. Digital skills lead to more satisfying jobs, more secure careers, and better pay – as much as a 65%

---

[7] https://www.autodesk.com/products/fusion-360/blog/limbitless-solutions/
[8] https://www.autodesk.com/design-make/research/spotlight-on-skills-in-the-age-of-ai

increase in pay over non-digital employees. With proper training, current and future workers alike stand to benefit from these advancements.

POLICY RECOMMENDATIONS

We commend the Committee for looking at this critical issue for the future of American manufacturing. AI presents a tremendous opportunity to improve productivity and global competitiveness. Autodesk offers the following recommendations for the Committee to consider as it continues its work.

- **Promote the benefits of AI for manufacturing and global competitiveness.** Partner with technology companies and manufacturers to develop national strategies that elevate the benefits and importance of AI for the future of American manufacturing. This effort should also identify and propose ways to mitigate obstacles to adoption of AI in manufacturing.

- **Accelerate digital transformation for small and medium manufacturers.** Targeted tax credits and access to low-cost capital for modernizing software and machinery are essential to enhancing the sector's resilience and the industry's global competitiveness, particularly for SME manufacturers. These would help drive needed investments in digital transformation from manufacturers, which is foundational to AI adoption.

- **Encourage the development and adoption of interoperability standards.** AI relies on data to train models. Industry standards that improve interoperability of hardware and software tools used in manufacturing will promote better data flow and sector efficiency. This will enable manufacturers to upgrade or integrate their technologies more easily and cost effectively.

- **Include factory design, construction, and operations in manufacturing initiatives.** Leveraging digital tools to design, build, and operate factories is a key opportunity for manufacturers to realize savings and efficiencies that support business growth. Any

initiatives supporting U.S. manufacturing should also prioritize ways to support the development of the most advanced and digitally connected, AI-enabled factories.

- **Continue to support the Manufacturing USA Institutes and Manufacturing Extension Partnerships (MEPs).** Continued support for these programs is crucial to innovation, regional manufacturing ecosystems, and SMEs. These resources can also drive specialized initiatives focused on accelerating SME digital transformation and AI adoption.

- **Target limited workforce resources to dedicated training for key sectors like manufacturing with a focus on digital and STEM skills.** This targeted approach will ensure economic competitiveness and help new and displaced workers upskill in the use of AI-enabled tools.

- **Support industry-led apprenticeships and programs that connect business and educators to identify skills gaps and develop tailored curriculums to train students and mid-career workers.** Strengthening the school-to-career pipeline is essential for building a resilient, digitally skilled workforce.

CONCLUSION

We have a tremendous opportunity to realize our collective mission to revitalize American manufacturing. This revitalization will be achieved through innovation and emerging technologies, like AI, in addition to the ingenuity of American manufacturers. We have the tools to drive technological advancement, create high-quality manufacturing jobs, and secure ongoing U.S. leadership in the global economy.

Embracing AI in manufacturing will not only strengthen the resilience and competitiveness of American manufacturing but also fuel long-term economic growth and prosperity. Autodesk stands ready as a committed partner, offering insights, technology, and expertise to help turn this vision into reality.