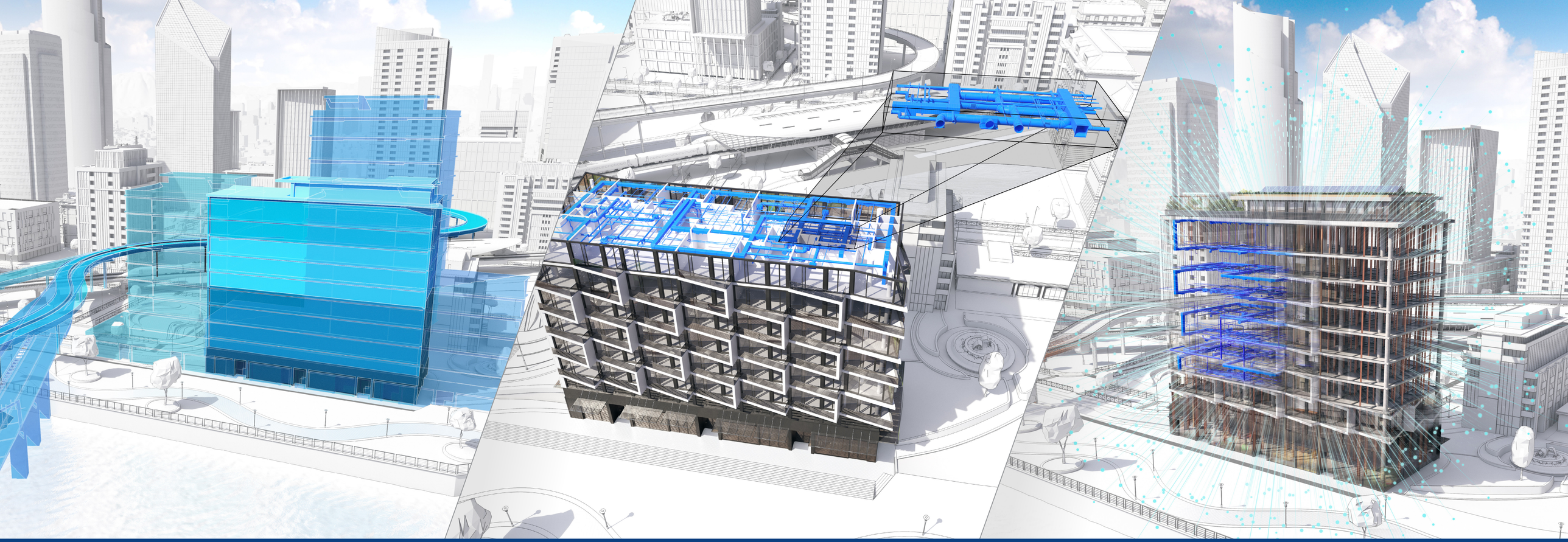


3 WAYS DESIGN CAN TAKE THE LEAD FOR PROJECT SUCCESS

AUTODESK.

Design's Challenges and New Opportunities

The AEC industry is faced with more pressure than ever before. Not only is there a growing demand for more buildings and infrastructure, but also aging assets across the globe are in dire need of retrofit and repair. At the same time, professionals in the industry must meet these goals with less: less waste, less reliance on finite natural resources, less energy to operate the built environment, and less dependency on a shrinking workforce.

This "more with less" challenge presents opportunities. We can address climate change through design that resists threats such as rising seas. We can create more resilient and more sustainable built assets that support the health and quality of human life.

Take the design of WILD—a self-sufficient, biodiverse floating island in one of the most northern parts of Norway. The idea for WILD is based on the need to provide solutions to simultaneous, worldwide crises and create a new urban life based on a circular economy that will empower cities and communities. Its design has the capability to produce its own power, fresh water, food, and heat as a closed biotope loop system.

Forward-thinking design firms are rapidly evolving to rethink project goals, using energy and materials more efficiently and designing buildings and infrastructure that reduce waste and increase safety and resiliency. And they are increasingly adopting new methodologies to make it happen.

The Evolving Nature of Design Practice

The design industry isn't simply responding to the global trends. Design is undergoing its own changes, which will enable the practice to better respond to client needs.

At no other time have designers had better tools at their disposal to communicate the power of design to clients and project stakeholders. Beauty, form, and function of an asset are now communicated alongside strategic outcomes for the entire lifecycle. Whether it's a building, bridge, or railway, design can ultimately determine sustainability, constructability, efficiency, owner-occupant usability, cost-effective operations, and so much more. Designers now have the data and insights needed to show where and how design decisions make the biggest impact.

With technology, designers are gaining the tools they need to be thoughtful and artful, even as they create solutions for operational functionality.

For the past 20 years, BIM brought about the reality of converging technologies and workflows to enable seamless collaboration, empower decision-making, and accelerate better project outcomes for all stakeholders across the AEC industry. But it never reached the full potential for the entire lifecycle—until now.

By embracing BIM for the full lifecycle, designers can accelerate digital transformation at their firms and better orchestrate processes that allow them to think about the outcomes they want for their projects. With a results-first approach enabled by disruptive processes like generative design and Design for Manufacturing and Assembly (DfMA), designers can have a greater impact on overall project success, creating projects that are better, faster, and higher-performing.

Instead of progressing in a series of steps focusing mainly on the design intent of a project, design now operates in parallel with construction and other practices, which helps avoid mistakes, realizes project designs faster, and improves repeatability.

Design intent is matched with construction intent, optimizing for every part of the design/build process. At the same time, the increasing digitization of the construction industry is a major factor in making this a reality.

Advancements in Design Transformation

In the following pages, we'll explore three advancements transforming design practice today, providing new competitive advantages, and placing design squarely in the leadership role.

Generative Design

Generative design empowers teams to define their desired outcomes and goals at the beginning of the project while maximizing machine intelligence and automation to explore, optimize, and evaluate whether the designs will meet those desired outcomes. This design approach provides better insights to enable faster, more informed decisions that can impact the entire project lifecycle.

Generative design frees designers from repetitive work and places a renewed focus on creativity and strategic decision-making. In turn, this has a bottom-line impact for architects and engineers to compete in the marketplace based on skill and expertise—not to mention the time saved by focusing on what's important for a project and not performing routine tasks.

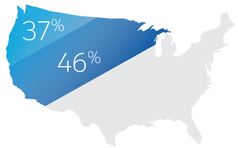
Design goals are often competing with one another. Maybe a designer is looking for the greatest energy efficiency, the highest solar potential, and lowest embodied carbon impact—all while giving building occupants the best views. Developing these goals—or outcomes—and ways to measure and analyze them digitally is extremely helpful in evaluating the tradeoffs.

At the same time, designers can identify and align project goals with stakeholders at the very beginning and throughout the project. Stakeholder alignment from the beginning leads to improved collaboration, reduced overall design time, and a net increase in workload capacity.

When it comes to design and construction working more in parallel, generative design can also improve efficiency of prefab parts development (also known as standardized components). For example, it can reduce the number of parts that need to be developed, which streamlines budgets, accelerates project timelines, and improves sustainability. This design trend helps optimize the use of materials and construction methods for a more sustainable and resilient outcome, such as in prefab construction.

Generative Design – Generative design is a form of artificial intelligence that leverages cloud computing to create better outcomes, allowing architects, engineers, and construction professionals to take a goal-driven approach to design.

Generative Design Use Poised to Expand



About half (46%) of surveyed U.S. architects and engineers are aware of generative design tools and practices, and over one-third (37%) of those are currently using them.

Several strong value propositions position generative design to grow significantly

- Generating and exploring more design alternatives that produce better, more functional final solutions
- Improved quality, budget control, documentation, and constructability
- Valuable ability to automate routine tasks

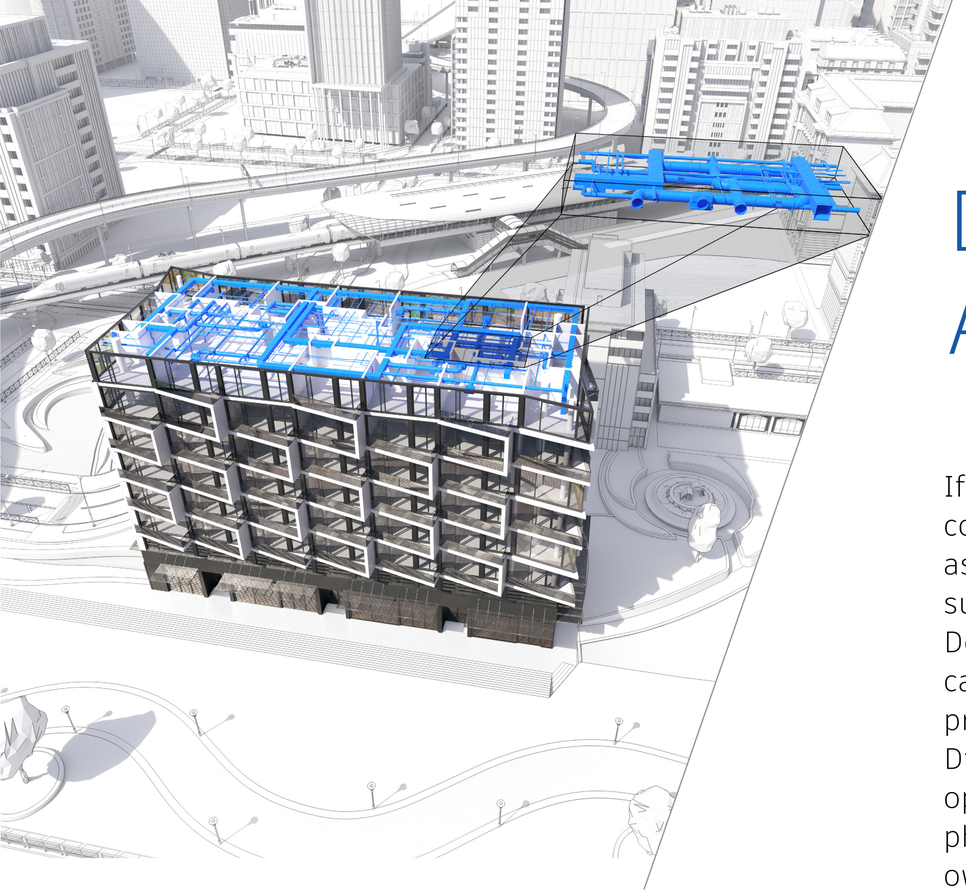
Users of computational design report some valuable benefits from their engagement

- 88% are successfully automating routine tasks by leveraging computational design, particularly MEP engineers (92%)
- A similar percentage (85%) report improved interoperability, particularly architects (89%). All users should see interoperability improve as integrated software platforms and common data environments that support and enable them.

Source: Dodge Data and Analytics

“We believe the introduction of Generative Design in Revit will allow AEC professionals to explore, evaluate, and identify solutions tailored to project goals and constraints—considering a wide range of factors like density, aesthetics, efficiency, and sustainability along the way. Through generative design technology, we’re striving to help these professionals spend less time on tedious tasks and, instead, focus their expertise on more complex design challenges.

– Vikram Dutt, Vice President, Architecture, Engineering & Construction Design Solutions, Autodesk



Design for Manufacturing Assembly (DfMA)

If the future calls for more industrialized construction achieved through design repeatability, as well as quality, speed of construction, sustainability, and efficiency improvement, then Design for Manufacturing and Assembly, or DfMA, can enable and optimize prefabrication and the productization of traditional construction processes. DfMA enables manufacturing, construction, and operation logic to be brought up front in the design phase—and not left to the general contractor or the owner to determine later in the project.

DfMA accelerates design innovation

As architects and engineers focus increasingly on outcome-based design, methodologies like DfMA combined with generative design will make the design process even more productive.

DfMA moves “make and operate” into “design”

Designers can take the lead with DfMA for better project outcomes now that delivery models are evolving and alternative models are quickly being embraced. As outcome-based design becomes more prevalent, designers can incorporate manufactured assemblies into workflows for improved construction speed, quality, construction certainty, and sustainability.

DfMA changes how designers think about project partners

As industries and multidisciplinary teams are blending together, DfMA is ushering in a new era of convergence. AEC professionals are embracing new ways of making, including workflow coordination and on-demand customization. By moving data to the cloud and shifting perspectives to a platform approach, DfMA blurs the lines of processes, creates new business models, and enables new value propositions for true convergence.

Design for Manufacturing and Assembly (DfMA)

Design for Manufacturing and Assembly (DfMA) is a set of design principles that enables and optimizes prefabrication and the productization of traditional construction processes. By simplifying the design of a product, it is possible to incorporate manufactured assemblies into workflows for improved construction speed, quality, construction certainty, and sustainability.

Achieve Ambitious Goals with DfMA

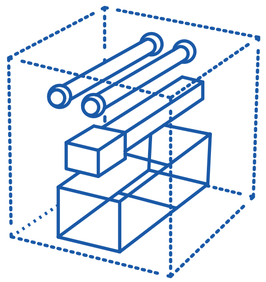
According to the Building Engineering Services Association (BESA), a widespread use of DfMA could even see the industry achieve the ambitious UK Government Construction 2025 blueprint, which has targets including a steep 33% reduction in initial and whole life cost of assets, 50% faster delivery, and 50% lower greenhouse gas emissions.

33% Reduction in costs

50% Faster delivery

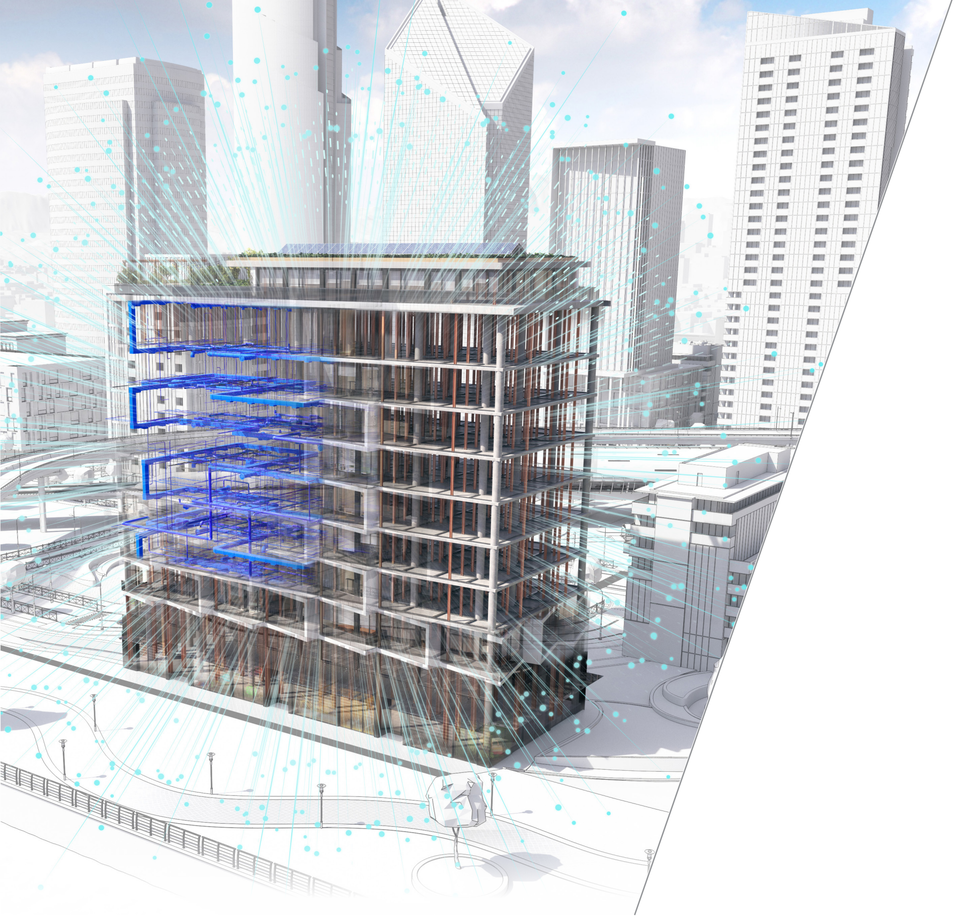
50% Lower greenhouse emissions

Source: Building Engineering Services Association (BESA)



“DfMA needs to ultimately be captured in the software so that we can connect designers and makers globally with real products in real time. That’s the vision for our Autodesk platform. Once we get there, DfMA and productization will enable architects and designers to be empowered to set parameters for aesthetics, performance, sustainability, cost certainty, product choice, schedule, and others. When coupled with other tools like generative design, they will be empowered to spend more time in areas they can provide additional and unique value and less time on low value, tedious work.

– Amy Marks, Head of Industrialized Construction Strategy and Evangelism, Autodesk



Digital Project Delivery – How project data is organized and managed for real-time coordination and collaboration throughout the project lifecycle. Using a common data environment (CDE) to store all models and multidisciplinary data can unlock significant improvements through data sharing and better coordination. It helps provide better insights for planning, designing, building, and operating capital assets.

Digital Project Delivery

For several decades, AEC project delivery has been evolving toward models that minimize perceived upfront cost to the owner. Traditionally, the design team generates a basis of design, which is then awarded to the lowest construction bidder, who then works with subcontractors to define and execute the construction intent of the project.

However, this separation of design and construction impedes many construction approaches, as well as the maximum benefits for the client. Over the past few years, collaborative project delivery models—such as design-build, public-private partnerships (P3), and integrated project delivery (IPD)—have been on the rise. This has emboldened firms to integrate design and construction teams throughout entire project lifecycles, rather than creating distinct design and construction phases.

This evolution has given rise to software tools that enable closer collaboration between design and construction firms for digital project delivery and the need for a cloud-based common data environment (CDE) where all project stakeholders can store and manage information, beginning with design.

By extending the BIM process into the cloud, digital project delivery delivers new benefits for real-time collaboration, data-driven decision-making, security, and risk mitigation.

With document management and control to the entire project team, AEC teams can simplify collaboration and data management across design to construction, streamline document review and approval workflows, and comply with key industry standards like ISO 19650 on every project.

New Ways of Working

It's also important to recognize that the way we work has dramatically shifted and will continue the transformation of digital project delivery workflows in the "next normal." To stay competitive, firms must prepare for the three W's of work:

W1 - Work from anywhere

Business continuity depends on rapid mobilization for anytime, anywhere work.

W2 - Work on anything

Empower teams with the flexibility to adapt to changing needs.

W3 - Work with insight

Move faster and more efficiently by leveraging data for better decision-making.

Cloud Technology Benefits

15%
Project lifecycle cost savings

30%
Construction time cost savings

Source: Boston Consulting Group

"We are committed to creating an environment where collaboration is efficient and seamless. Looking forward, we envision a future that frees our customers from exchanging cumbersome files and PDFs and embraces workflows that transfer just the data needed to achieve the desired outcome. In this future, new forms of collaboration and new ways of creating value are the norm and will extend the value of design data further downstream.

– Amy Bunszel, Executive Vice President for Architecture, Engineering, and Construction Design Solutions, Autodesk

Discover how innovative firms are embracing new design approaches by leveraging Generative Design, DfMA or Project Delivery in their projects.

Generative Design

Discover how Stamhuis designs retail stores in minutes rather than days with generative design

Learn how GHD's master planning process is reinvented with outcome-based design approach

Design for Manufacturing Assembly (DfMA)

Discover how Bryden Wood transformed their business with DfMA

Digital Project Delivery

See how TES Group is driving business growth with a move to the cloud

Design Vision Becomes Reality

These advancements are part of a vision for design where we protect, preserve, and maintain the built environment. With the right tools and processes, designers can drive change—creating a modern, connected, and insightful design environment that empowers the vital work of building a better future for all.

The promise of BIM is finally here and reaching the intended goal for the full project lifecycle. The entire technology ecosystem is expanding so firms can diversify their offerings and how they operate—whether it's the increased use of generative design, DfMA, or digital project delivery workflows. BIM is the glue that not only keeps it all together, but also enables innovation.

Sources

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